SECTION 901 MOBILIZATION

901-1 Description:

The work under this section shall consist of preparatory work and operations, including but not limited to, the movement of personnel, equipment, supplies and incidentals to the project site; the establishment of all offices, buildings and other facilities necessary for work on the project, and for all other work and operations that must be performed and costs incurred prior to beginning work on the various items on the project site.

901-2 Blank

901-3 Blank

901-4 Method of Measurement:

Mobilization will be measured for payment by the lump sum as a single complete unit of work.

901-5 Basis of Payment:

Payment for mobilization, measured as provided above, will be made at the contract lump sum price, which shall be full compensation for supplying and furnishing all materials, facilities and services and performing all the work involved as specified herein.

Partial payments under this item will be made in accordance with the following provisions:

The first payment of the lump sum price for mobilization will be paid after the Preconstruction Conference provided that all submissions required under Subsection 108.03 are submitted by the contractor at the Preconstruction Conference to the satisfaction of the Engineer. The amount paid for the first partial payment will be in accordance with Table 901-1.

The second payment of the lump sum price for mobilization will be made when the Engineer has determined that a significant amount of equipment has been mobilized to the project site which will be used to perform portions of the contract work. The amount paid for the second partial payment will be in accordance with Table 901-1.

The third payment of the lump sum price for mobilization will be made on the first estimate following completion of five percent of the contract. The amount paid for the third payment will be in accordance with Table 901-1.

The fourth payment of the lump sum price for mobilization will be made on the first estimate following completion of 10 percent of the contract. The amount paid for the fourth payment will be in accordance with Table 901-1.

The total sum of all payment shall not exceed the original contract amount bid for mobilization, regardless of the fact that the contractor may have, for any reason, shut

down its work on the project or moved its equipment away from the project and back again.

TABLE 901-1 AMOUNT ALLOWED FOR MOBILIZATION DURING THE LIFE OF THE CONTRACT		
Contract Amount: $	**% Of Contract**	**Basis Of Payment**
0 - 5,000,000	12% *	25% of the lump sum price for mobilization or 3% of the original contract amount, whichever is less.
5,000,000 +	10% *	25% of the lump sum price for mobilization or 2.5% of the original contract amount, whichever is less.
* If the price bid for mobilization exceeds this percentage, any excess will be paid to the contractor upon completion of the contract.		

The adjustment provisions in Section 104 and the retention of funds provisions in Section 109 shall not apply to the item of mobilization.

When other contract items are adjusted as provided in Section 104, and if the costs applicable to such items of work include mobilization costs, such mobilization costs will be considered as recovered by the contractor in the lump sum price paid for mobilization, and will be excluded from consideration in determining compensation under Section 104.

When mobilization is not included as a contract item, full compensation for any necessary mobilization required will be considered as included in the prices paid for the various contract items involved and no additional compensation will be made.

SECTION 902 CHAIN LINK FENCE

902-1 Description:

The work under this section shall consist of furnishing all materials and constructing chain link fence and gates at the locations and in accordance with the details shown on the plans. Chain link fence shall be either Type 1 or 2 and shall be constructed in accordance with the requirements of these specifications.

The type and height of chain link fence to be constructed will be shown on the project plans.

Chain link fabric shall be constructed of either zinc-coated steel or aluminum-coated steel. Posts, hardware and fittings shall be either zinc-coated steel or aluminum-coated steel. The option used shall be the same on any one project.

The work under this section shall also include constructing chain link fence and gates from salvage.

902-2 Materials:

902-2.01 General:

Certificates of Compliance conforming to the requirements of Subsection 106.05 of the Standard Specifications shall be submitted for all materials except for Subsection 902-2.08 Barbed Wire. Barbed Wire will be sampled and tested in accordance with methods used by the Department and will require written approval by the Engineer prior to being incorporated into the work.

902-2.02 Posts:

(A) General:

Posts shall be round pipe, H-section or roll-formed and shall conform to the nominal dimensional requirements shown on the plans. In addition, the material of which posts are fabricated shall have a nominal thickness, before galvanizing, of not less than 0.111 inches. The option of post type used shall be the same on any one project.

Posts shall have provisions to securely hold the top tension wire in position and allow for removal and replacement of a post without damaging the top tension wire. Tubular posts shall be fitted with rain-proof tops.

(B) Round Pipe:

Pipe shall be zinc-coated (galvanized) round steel pipe conforming to the requirements of ASTM A 53, Type E or S, Grade A, Standard Weight, Schedule 40 or shall be round pipe conforming to all of the requirements of AASHTO M 181 for Grade 2 pipe. In addition, Grade 2 pipe furnished with an organic topcoat shall have a separate chromate chemical treatment of 15 micrograms per square inch applied to the zinc coating prior to application of the organic topcoat.

(C) H-Section Posts:

H-section posts shall be manufactured from steel conforming to the minimum requirements of AASHTO M 223, Grade 42, and shall meet the zinc coating, strength and dimensional requirements of AASHTO M 181 for Type I, Grade 1 steel posts.

(D) Roll Formed Posts:

Roll formed posts shall be manufactured from steel sheet and strip conforming to the minimum requirements of ASTM A 570, Grade 45 and shall meet the strength and dimensional requirements of AASHTO M 181 for Type I roll-formed posts. The required coating shall be a hot-dip zinc coating in accordance with the requirements of AASHTO M 181 for Grade 1 steel posts or a coating system meeting the exterior coating requirements of AASHTO M 181 for Grade 2 round steel posts consisting of a hot-dip zinc coating, chromate chemical treatment, and organic topcoat.

902-2.03 Concrete:

Concrete for post footings shall be utility concrete conforming to the requirements of Section 922.

902-2.04 Fence Fabric:

Steel wire constituting the fence fabric shall meet the minimum breaking strength shown in Table 2 of AASHTO M 181 for Type I or II wire when tested in accordance with AASHTO T 68.

Chain link fence fabric shall be either zinc-coated or aluminum-coated steel wire fence fabric. Zinc-coated steel fabric shall conform to the requirements of ASTM A 392, Class 1 coating. Aluminum-coated steel fabric shall conform to the requirements of ASTM A 491, with a minimum weight of coating of 0.40 ounces per square foot of wire surface area. The wire used for aluminum-coated chain link fence fabric shall be coated before weaving into fabric. The wire used in the manufacture of the fabric shall be 11 gauge for all fence fabric 60 inches or less in height and shall be nine gauge for fabrics greater than 60 inches in height.

Chain link fence fabric shall be woven throughout in the form of approximately two-inch square mesh. Fabric 60 inches or less in height shall be furnished with knuckling on one selvage and barbing on the other, and fabric over 60 inches shall be furnished with barbing on both selvages.

902-2.05 Tension Wire and Fabric Fasteners:

Tension wire shall be seven gauge (0.177 inch diameter) coil spring steel wire of good commercial quality with a minimum tensile strength of 75,000 pounds per square inch, and shall be zinc-coated or aluminum-coated. Zinc-coated steel wire shall have a minimum coating of 0.8 ounces per square foot of uncoated wire surface. Aluminum-coated steel wire shall have a minimum coating of 0.4 ounces per square foot of uncoated wire surface.

Tie wires, hog rings and post clips shall be zinc-coated or aluminum-coated steel of good commercial quality and shall be of the same diameter and breaking strength as the fence fabric being fastened. The minimum weight of zinc-coating shall conform to the requirements of ASTM A 641, Class 3. The minimum weight of aluminum coating shall be 0.4 ounces per square foot of wire surface area.

902-2.06 Truss Rods and Tighteners:

Truss rods and tighteners shall be fabricated from commercial quality steel and shall be zinc-coated in accordance with the requirements of AASHTO M 111. Truss rods shall be 3/8-inch diameter adjustable rods. Truss tighteners shall have a strap thickness of not less than 1/4 inch.

902-2.07 Miscellaneous Fittings and Hardware:

Structural bars, stretcher bar bands, post caps and miscellaneous hardware shall be fabricated from commercial quality steel and shall be zinc-coated in accordance with the requirements of AASHTO M 111. Stretcher bars shall be 3/16-inch by 3/4-inch steel flat bars. Stretcher bar bands shall be 1/8-inch by one-inch preformed steel bands.

902-2.08 Barbed Wire and Barbed Wire Support Arm:

Barbed wire for use with Type 2 chain link fence shall conform to the requirements of Subsection 903-2.04(A).

Barbed wire support arm shall be of the type shown on the plans, shall be fabricated from commercial quality steel, and shall be zinc-coated in accordance with the requirements of AASHTO M 111.

902-2.09 Gates:

Gates shall be of the sizes shown on the plans. Gates greater than eight feet in width shall have a vertical member installed at the midway point of the gate.

Gate frames shall be constructed of not less than 1-1/2 inch steel pipe and interior vertical members shall be constructed of not less than one-inch pipe. Pipe shall be zinc-coated steel pipe conforming to the requirements of ASTM A 53, Standard Weight, Schedule 40, or shall be round pipe conforming to all of the requirements of AASHTO M 181 for Class 2 pipe.

Gate frames shall be fastened together at the corners by welding. Welding shall be performed in accordance with the requirements of the American Welding Society, Structural Welding Code, D1.1-80 and as modified by AASHTO Standard Specifications for Welding of Structural Steel Highway Bridges.

Truss rods and tighteners for the gate frames shall conform to the requirements specified herein under Subsection 902-2.05.

Fabric for the gates shall be of the same kind used for the adjoining chain link fence and shall be attached to the gate frame by the use of stretch bars, stretcher bands and tie wires as specified under Subsection 902-3.03.

Gates shall be hung by at least two steel, ductile iron or malleable iron hinges not less than three inches in width, so designed as to securely clamp to the gate post and permit the gate to be swung back against the fence.

Gates shall be provided with a combination steel, ductile iron or malleable iron catch and locking attachment which will not rotate around the latch post. Stops to hold gates open shall be provided where required.

902-3 Construction Requirements:

902-3.01 General:

In areas where there is livestock, the contractor shall take all measures necessary to restrict the livestock to the land where it is being kept. The contractor shall furnish all materials and construct temporary fence, gates and cattle guards as may be necessary to restrict the livestock as specified.

Existing fences that are to remain in place and which have been damaged by the contractor's operations shall be replaced or restored by the contractor at no additional cost to the Department in accordance with the provisions of Subsection 107.12.

The contractor shall clear the fence lines of all earth, trees, brush and other obstructions which interfere with the proper construction of the fences, unless the Engineer orders certain trees to remain in place. Disposal of removed material shall be in accordance with the requirements of Subsection 201-3.02. Clearing the fence line shall be within the highway right-of-way. Fence shall be constructed within the highway right-of-way as shown on the plans.

902-3.02 Setting Posts:

Line posts shall be spaced at not more than 10-foot intervals measured from center to center of posts and such measurement shall be made parallel to the slope of the natural ground.

End, intermediate and corner post assemblies shall be as shown on the plans. Intermediate post assemblies shall be spaced at 500-foot intervals or midway between pull posts when the distance between such posts is less than 1,000 feet and more than 500 feet.

All posts shall be placed in a vertical position, except in unusual locations where the Engineer may direct that the posts be set perpendicular to the ground surface. All posts shall be set in concrete footings conforming to the details shown on the plans and crowned at the top to shed water.

Fence fabric or wire shall not be attached to the posts until the concrete has cured a minimum of 72 hours.

At locations where a change in the vertical alignment of the fence line forms an angle of deflection of 10 degrees or more, a corner post assembly shall be provided. A change in the horizontal alignment of the fence line where the angle of deflection is 30 degrees or more shall be considered as a corner and a corner post assembly shall be installed.

902-3.03 Installing Fence Fabric:

Chain link fence fabric shall be fastened on the outward facing side of the posts, unless otherwise specified by the Engineer. The fabric shall be stretched taut and fastened to the posts and between posts the top and bottom edges of the fabric shall be fastened to the tension wires. The tension wires shall be stretched tight and installed on a straight grade

between posts. The distance from the top of the fabric to the top tension wire shall be two inches maximum.

The fabric shall be fastened to end, corner, latch, gate and pull posts with stretcher bars and stretcher bar bands. Stretcher bar bands shall be spaced at intervals not exceeding 14 inches. The fabric shall be fastened to the line posts with the wires or post clips spaced at intervals not exceeding 14 inches and to the tension wires with the wires or hog rings spaced at 18 inches center to center.

Selvage at bottom of chain link fence fabric shall be barbed, unless otherwise specified. Selvage at top of chain link fence fabric shall be barbed for heights of six feet and over, and shall be knuckled for heights less than six feet.

902-3.04 Barbed Wire:

Barbed wire for Type 2 fence shall be pulled taut before being permanently attached to the barbed wire extension arms and to the posts. Barbed wire across the top of a gate frame shall be made taut by means of eye bolts or ratchet bands at each end.

A maximum of two splices on barbed wire will be allowed between post assemblies but not on the same wire. No splicing will be allowed within 100 feet of a pull post.

902-3.05 Construct Chain Link Fence from Salvage:

Portions of the existing chain link fence, including gates, designated for removal and salvage shall be constructed at the new locations shown on the project plans and shall be constructed in accordance with the provisions specified herein for new chain link fence.

The contractor may, at its option and at no additional cost to the Department, construct new chain link fence in lieu of constructing chain link fence from salvage. If the contractor elects to construct new chain link fence, the fence materials originally designated for construction from salvage shall become the property of the contractor.

All posts, pipe, fabric or hardware which are deemed by the Engineer to be unsuitable for use in reconstructing the chain link fence shall be removed and disposed of as directed by the Engineer. If any of these materials require replacement to complete the quantity of chain link fence to be constructed, the materials shall be furnished by the contractor and will be paid for as specified in Subsection 109.04.

902-4 Method of Measurement:

Chain link fence will be measured by the linear foot of each type and size of fence specified. Measurement will be made along the top of the completed fence from outside to outside of end posts, excluding the widths of gate openings. Gate posts and latch posts will be considered as included in the measurement of the completed fence.

Gates will be measured by the unit of each type and size of gate specified. A gate unit complete in place shall include the necessary fittings, hardware, and gate bracing.

Constructing the various types of chain link fence or gates from salvage will be measured by the linear foot or by the unit each, using the limits of measurement specified for new construction.

902-5 Basis of Payment:

The accepted quantities of chain link fence and gates or construct chain link fence and gates from salvage, measured as provided above, will be paid for at the contract unit price per linear foot for the type and size of fence and per each for the type and size of gates designated in the bidding schedule, complete in place.

The accepted quantities of construct chain link fence from salvage, measured as provided above, will be made at the contract unit price per linear foot, complete in place, including excavation, footing concrete, backfill and disposal backfill and disposal of surplus material. Any new posts, pipe, fabric or hardware furnished by the contractor to replace salvaged chain link fence components deemed by the Engineer to be unsuitable for use, will be measured and paid for in accordance with the provisions of Subsection 104.02.

No payment will be made for furnishing materials and constructing temporary fence, gates and cattle guards as may be necessary to restrict livestock.

SECTION 903 WIRE FENCE:

903-1 Description:

The work under this section shall consist of furnishing all materials and constructing barbed wire fence, woven wire fence, game fence, antelope fence and gates at the locations and in accordance with the details shown on the plans. Fences and gates shall be of the types and sizes shown on the plans and shall be constructed in accordance with the requirements of these specifications.

The type of fence to be constructed will be shown on the project plans.

903-2 Materials:

903-2.01 General:

Certificates of Compliance conforming to the requirements of Subsection 106.05 of the Standard Specifications shall be submitted for all materials except for Subsection 903-2.02, Posts and Braces, and Subsection 903-2.04, Fencing Wire. Subsections 903-2.02 and 903-2.04 will be sampled and tested in accordance with methods used by the Department and will require written approval by the Engineer prior to being incorporated into the work.

903-2.02 Posts and Braces:

Line posts shall conform to the requirements of ASTM A 702. Lengths of posts shall be as shown on the plans. Packaging of posts will not be required. The type of post furnished, tee, channel or U or Y type, shall be the same on any one project.

End, corner, pull, latch and gate posts and braces shall conform to the requirements of ASTM A 702, for uprights and braces.

Posts and braces shall be painted green.

903-2.03 Concrete:

Concrete for post footings shall be utility concrete conforming to the requirements of Section 922.

903-2.04 Fencing Wire:

(A) Barbed Wire:

Barbed wire shall be 12-1/2 gauge steel wire with four-point 14-gauge barbs spaced five inches apart and shall be either zinc-coated or aluminum-coated. Zinc-coated steel wire shall conform to the requirements of ASTM A 121, Class 1 coating. Aluminum-coated steel wire shall conform to the requirements of ASTM A 585, Type I.

(B) Barbless Wire:

Barbless wire shall meet the same requirements as barbed wire, except that the barbs shall be omitted.

(C) Woven Wire Fabric:

Woven wire fabric shall be either zinc-coated or aluminum-coated. Zinc-coated woven wire shall conform to the requirements of ASTM A 116 for No. 11 gauge wire, Class 1 coating, with fabric stay wires six inches apart. Aluminum-coated woven wire shall conform to the requirements of ASTM A 584, for No. 11 gauge wire, with fabric stay wires six inches apart.

903-2.05 Stays and Fasteners:

Stays shall be 9-1/2 gauge twisted wire designed for screw-on type installation. Stays shall be zinc-coated steel of good commercial quality. The minimum weight of zinc-coating shall be 0.3 ounces per square foot of uncoated wire surface.

Tie wires, hog rings and post clips shall be zinc-coated steel of good commercial quality and shall be of the same diameter as the fence fabric being fastened.

The minimum weight of zinc-coating shall be 0.3 ounces per square foot of uncoated wire surface.

903-2.06 Gates:

(A) Type 1 Gate:

Gates shall conform to the requirements of Subsection 902-2.09, except as specified herein.

Gates greater than five feet in width shall have a vertical member installed at the midway point of the gate.

Fabric for the gates shall be either chain link fence fabric or woven wire fabric. Chain link fence fabric shall conform to the requirements of Subsection 902-2.04 for fabric using 11 gauge wire. Woven wire fabric shall be of the same kind used for the adjoining woven wire fence. When the adjoining fence is barbed wire fence, gate fabric shall be of the kind used with Type 2 woven wire fence.

Gates shall be hung by at least two steel, ductile iron, or malleable iron hinges so designed as to securely clamp to the type of gate post furnished and permit the gate to be swung back against the fence.

Gates shall be provided with a combination steel, ductile iron, or malleable iron catch and locking attachment which will not rotate around the latch post. Stops to hold gates open shall be provided where required.

(B) Type 2 Gate:

Type 2 gates shall be constructed so that each line of wire will be securely attached to the gate post and to the latch board. The three vertical wire stays, placed within the gate, shall be equally spaced. Above the top fence wire and below the bottom fence wire, a double strand of steel wire shall be placed around the latch post forming loops of such size that they will accept the ends of the latch board. A pry stick shall be sewed to the gate post so as to draw the fence to a taut condition when closed.

The latch board and pry stick assembly shall be made of wood or of steel. Wood shall be clear select Douglas fir, two inch by two inch by four feet for the latch board and two inch by two inch by two feet for the pry stick. Steel latch board and pry stick shall be fabricated from the same type of steel utilized for line posts.

903-3 Construction Requirements:

903-3.01 General:

In areas where there is livestock, the contractor shall take all measures necessary to restrict the livestock to the land where it is being kept. The contractor shall furnish all materials and construct temporary fence, gates and cattle guards as may be necessary to restrict the livestock as specified.

Existing fences that are to remain in place and which have been damaged by the contractor's operations shall be replaced or restored by the contractor at no additional cost to the Department in accordance with the provisions of Subsection 107.11.

The contractor shall clear the fence lines of all earth, trees, brush and other obstructions which interfere with the proper construction of the fences, unless the Engineer orders certain trees to remain in place. Clearing the fence line shall be within the highway right-of-way. Disposal of removed material shall be in accordance with the requirements of Subsection 201-3.02.

Fence shall be constructed within the highway right-of-way as shown on the plans.

903-3.02 Setting Fence:

Fence posts shall be spaced at the intervals and set to the depths shown on the plans.

In determining the post spacing, measurements shall be made parallel to the ground slope, and all posts shall be placed in a vertical position, except in unusual locations where the Engineer may direct that the posts be set perpendicular to the ground surface.

Line posts may be driven into undisturbed earth provided driving does not injure the posts. All voids around the post shall be backfilled and the material thoroughly tamped.

End, corner, pull, latch and gate posts and braces shall be set in concrete footings crowned at the top to shed water.

Any high points which interfere with the placing of wire fence fabric shall be excavated to provide the clearance shown on the plans.

Changes in the horizontal alignment of the fence line where the angle of deflection is 15 degrees or more shall be considered as corners and a corner post assembly shall be installed. Changes in fence alignment where the angle of deflection is less than 15 degrees but more than five degrees shall be considered as alignment angles and diagonal tension wires shall be installed. The diagonal tension wires shall consist of two twisted steel wires and shall be attached to the adjacent line posts.

Where the fence line intersects a cross fence, the wires of the existing cross fence shall connect to an end post assembly as shown on the plans.

Connecting fence assemblies with braces for every direction of strain shall be placed at the junction with new fences.

Intermediate post assemblies shall be installed at not more than 650-foot intervals between other braced posts, but for woven wire fence the spacing shall be such as to use standard rolls of fabric with a minimum of cutting and waste. After post assemblies have been placed, the barbed wire and woven wire fabric shall be pulled taut to the satisfaction of the Engineer, and each longitudinal wire shall be cut and securely fastened to the braced post with devices customarily used for the purpose. Barbed wire or woven wire fabric shall not

be carried past a post assembly, but shall be cut and fastened to the post independently of the adjacent spans. A maximum of two splices on barbed wire will be permitted between post assemblies, but not on the same wire. No splice shall be placed closer than 100 feet to any post assembly.

Where fence lines are interrupted by openings for gates and cattle guards, intermediate post assemblies shall be installed at both sides of the opening at a distance of one panel width from the end of the opening.

After the tensioning of the barbed wire or woven wire fabric between two post assemblies, all longitudinal wires shall be attached to each intervening line post at the height and spacing as shown on the plans. The distance from the bottom wire to the ground may vary at any one point from that shown on the plans four inches plus or minus for barbed wire fence and game fence and one inch plus or minus for woven wire fence. Where abrupt changes occur in the fence line grade, intermediate line posts may be required to maintain proper distances between the bottom wire and the ground.

Spacing of the twisted vertical wire stays shall be as shown on the plans for each type of fence. The vertical wire stays shall be woven into every horizontal wire for each type of fence.

At all grade depressions where stresses tend to pull the posts from the ground, the affected fence posts shall be anchored in concrete or the fence wires shall be weighted with concrete sag weights. The volume of concrete required to anchor the posts shall be not less than one cubic foot. Fence sag weights shall weigh not less than 100 pounds and shall be made with a wire loop hanger embedded in the concrete. A double strand of wire shall be attached to each horizontal line of barbed wire and to the top and bottom wire of the woven wire fabric and tied to the wire loop hanger of the sag weight.

903-3.03 Flood Gates:

Flood gates shall be constructed at the locations specified on the project plans or where designated by the Engineer and in accordance with the details shown on the project plans. If the length of the flood gate is such that the Engineer determines that line posts are needed, the posts shall be placed as necessary and driven to the depth required to keep the flood gate upright.

Flood gates shall be constructed to the same requirements specified for barbed wire fence construction, except that the concrete sag weights shall weigh 35 pounds.

903-4 Method of Measurement:

Wire fence will be measured by the linear foot of each type of fence specified. Measurement will be made along the top of the completed fence from outside to outside of end posts, excluding the widths of gate and cattle guard openings. Gate posts and latch posts will be considered as included in the measurement of the completed fence.

Type 1 gates will be measured as a complete unit in place by the width of the gate opening. Double gates will be measured as one complete unit by the width of the gate opening. A gate unit complete in place shall include the gate with all necessary fittings, hardware, and gate bracing.

Type 2 gates will be measured as a complete unit in place by the width of the gate opening. A gate unit complete in place shall include the wire gate with vertical stays, latch board and pry stick.

Flood gates will be measured by the linear foot. Measurement will be made on the fence line along the top wire from gate post to gate post as shown on the plans, but exclusive of any Type 2 gates.

903-5 Basis of Payment:

The accepted quantities of wire fence and flood gates, measured as provided above, will be paid for at the contract unit price per linear foot for the type of fence and gate designated in the bidding schedule, complete in place.

Types 1 and 2 gates, measured as provided above, will be paid for at the contract unit price per gate for the type designated in the bidding schedule, complete in place.

No payment will be made for furnishing materials and constructing temporary fence, gates and cattle guards as may be necessary to restrict livestock.

SECTION 904 CHAIN LINK CABLE BARRIER:

904-1 Description:

The work under this section shall consist of furnishing all materials and constructing chain link cable barrier fence at the locations and in accordance with the details shown on the project plans and in accordance with the requirements of the plans and these specifications.

904-2 Materials:

Certificates of Compliance conforming to the requirements of Subsection 106.05 shall be submitted.

The wire rope and swaged connection assembly and the associated nuts and washers shall conform to the requirements for the cable assembly specified under Subsection 1012-2, except that the length of the wire rope and the stud bolts shall be as shown on the project plans, and the wire rope shall conform to the requirements of AASHTO M 30, Class B, Type II.

Concrete shall be Class S Portland cement concrete conforming to the requirements of Section 1006.

Welded wire fabric shall conform to the requirements of Section 1003.

The chain link fence fabric, ties, fasteners, hardware and other fittings shall be of the dimensions shown on the project plans and shall conform to the requirements of Subsection 902-2.

All structural steel shall conform to the requirements of ASTM A 36, except that the anchor plate shall be made of steel conforming to the requirements of ASTM A 572 or A 588. All structural steel shall be galvanized in accordance with the requirements of ASTM A 123.

904-3 Construction Requirements:

In addition to the requirements of this section, the construction of the chain link cable barrier shall conform to the applicable requirements of Section 902 and Section 905.

The excavation for the concrete anchor block shall be to the neat lines shown on the project plans, with a maximum of three inches outside those lines. The entire volume of the excavation shall be filled with concrete.

The chain link cable barrier shall be constructed at the location shown on the project plans and to the lines and grades established by the Engineer. The chain link fence and cables shall follow the contours of the finished ground surface. The cables shall have only enough tension to prevent them from sagging more than one inch between clamps.

904-4 Method of Measurement:

Chain link cable barrier will be measured by the linear foot along the top strain wire from center to center of the fence post at each end.

904-5 Basis of Payment:

The accepted quantities of chain link cable barrier, measured as provided above, will be paid for at the contract unit price per linear foot, complete in place, including excavating, furnishing and placing concrete and reinforcing steel for the footings, disposal of surplus material, and grading immediately adjacent to the barrier.

SECTION 905 GUARDRAIL:

905-1 Description:

The work under this section shall consist of furnishing all materials and constructing new guardrail, reconstructing existing guardrail, or constructing guardrail from salvage, all at the locations shown on the project plans and in accordance with the details shown on the plans and the requirements of these specifications.

This item shall also include all the work and materials to install and delineate guardrail terminals, including all necessary components and markings, installed new, reconstructed, or constructed from salvage in accordance with the details shown on the plans and as herein specified.

905-2 Materials:

Materials for guardrail shall conform to the requirements of Section 1012.

Prismatic guardrail reflector tabs and prismatic guard-rail-mounted barrier markers shall conform to the requirements of Section 1008. The body of the prismatic guardrail reflector tabs shall have a minimum thickness of 3/16 inch, and be either galvanized steel or ultraviolet-resistant plastic. Prismatic reflectors shall be 3-1/4 inches in diameter, and shall be secured to the body in accordance with the manufacturer's recommendations. Prismatic guard-rail-mounted barrier markers shall be ultraviolet-resistant, and shall have a trapezoidal-shaped body in accordance with Standard Drawing 4-M-10.01.

Post-mounted L-shaped barrier markers, and flexible guardrail markers shall be made of a high quality, impact and ultraviolet resistant, flexible, white-colored plastic or similar material with a minimum thickness of 3/16 inch. This material shall be configured into a rectangular body that is flat, curvilinear or tubular with a width between three and four inches. The minimum reflective area for L-shaped post-mounted barrier markers shall be ten square inches. The reflectorized surface for flexible guardrail markers shall be three inches wide by five inches long.

Adhesive materials for applying reflective sheeting to guardrail terminals, post-mounted L-shaped barrier markers, metal or plastic guardrail reflector tabs, and flexible guardrail markers shall be in accordance with the sheeting manufacturer's recommendations.

Guardrail delineator material shall be specifically manufactured to provide roadside delineation. All delineators shall consist of complete units that are precut, pre-drilled as applicable, and ready to be installed in the field. The delineators shall be packaged in such manner as to prevent damage and deterioration during shipping and storage.

Reflective sheeting for guardrail terminals, and for guardrail delineation shall consist of a retroreflective system having a smooth outer surface and conforming to all criteria in AASHTO M 268 for the applicable sheeting type, including class, color, specific intensity per unit area (SIA), color processing, adhesive, and artificial weathering. Reflective sheeting used on post-mounted L-shaped barrier markers, on guardrail reflector tabs, and on post-mounted guardrail reflectors shall be sheeting Type IV, V, or VI.

Transparent colors, inks and paints used in object marker fabrication shall be of the type and quality recommended by the sheeting manufacturer. Transparent colors shall be applied with screen mesh P.E. 157 using fill pass.

Flexible guardrail markers, reflective sheeting products and inks approved for use are shown on the Department's Approved Products List (APL). Copies of the most current

version of the APL are available on the internet at http://www.dot.state.az.us/ABOUT/atrc/apl.htm.

905-3 Construction Requirements:

905-3.01 General:

The construction of the various types of guardrail shall include the assembly and erection of all component parts complete at the locations shown on the project plans or as directed by the Engineer. All materials shall be new except as provided for under Subsections 905-3.04 and 905-3.05.

The various types of guardrail shall be constructed with either steel posts and steel blocks or wood posts and wood blocks, at the option of the contractor, except where the post materials to be used are specified on the plans. The same type of post shall be used in any one continuous length of guardrail.

All metal work shall be fabricated in the shop. No punching, drilling, cutting or welding shall be done in the field, except as provided for under Subsections 905-3.04 and 905-3.05. All metal cut in the field shall be cleaned and painted with two coats of zinc paint, in accordance with Section 1002.

Where field cutting or boring of wood posts and blocks is permitted, the affected areas shall be thoroughly swabbed with at least two applications of the same type of wood preservative as initially used.

Where wood posts with rectangular sections are used, the posts shall be set so that the longest dimension is perpendicular to the rail.

Where a post is to be set in concrete, the concrete shall be placed against undisturbed material in the excavated hole. Before the post is set in the hole, a 1/2-inch thickness of polystyrene material shall be placed to cover all sides and corners of the embedded portion of the post for the full depth of the concrete. The polystyrene material shall not be nailed or clipped to the post, but shall be held against the post in a manner approved by the Engineer.

All bolts shall extend beyond the nuts a minimum of two threads, except that all bolts on posts adjacent to pedestrian traffic shall be cut off flush to the nut.

Bolts extending more than two inches beyond the nut shall be cut off less than 1/2 inch beyond the nut.

Unless otherwise shown on the plans, bolts shall be torqued as follows:

Bolt Diameter: inches	Torque: Foot - Pounds
5/8	45 - 50
3/4	70 - 75
7/8 and larger	120 - 125

All bolts, other than those specified to be torqued, shall be securely tightened.

Guardrail elements shall be spliced by lapping in the direction of traffic in the nearest adjacent lane.

All guardrail delineation shall be installed in accordance with the manufacturer's recommendations and as specified herein.

Within the transition section of each guardrail terminal unit installed at average elevations under 4,000 feet, prismatic guardrail-mounted barrier markers shall be attached on posts as specified in Table 905-1 of the Special Provisions. Post numbering within the transition shall be as shown in the approved manufacturer's drawings. The prismatic barrier markers shall be mounted to the guardrail W-beam.

For elevations 4,000 feet and higher, post-mounted L-shaped guardrail markers shall be used in place of the prismatic barrier markers on the same posts. Post-mounted L-shaped barrier markers shall be secured to the top of guardrail post, placed as close as possible to the roadway edge of the post, and aimed directly at the oncoming traffic of the nearest traveled lane. If nails are used to secure the top of post markers, a minimum of two shall be used, and driven at an angle to prevent the post from splitting. The contractor may use L-shaped guardrail markers at lower elevations as an alternative to prismatic guardrail-mounted barrier markers as long as consistency is maintained throughout the project.

For all guardrail not included in guardrail terminals, guardrail reflector tabs shall be installed on the W-beam at every sixth post, beginning with the post number shown in the Special Provisions. On radial sections of guardrail, the reflector tabs shall be placed on the W-beam at every other post. The slotted part of the tab shall be installed under the mounting bolt head so that the reflectorized surface of the tab faces oncoming traffic. The exposed ends of the slotted part of the tab shall be bent up against and then over the top of the bolt head.

In addition to the guardrail reflector tabs, flexible guardrail markers shall also be installed for guardrail not included in the transition sections when the average project elevation, as shown on the plans, is greater than 4,000 feet. Flexible guardrail markers shall be installed on every 18th guardrail post beginning with the post number shown in the Special Provisions. The reflector body shall be of sufficient length so that the mounting height of the top of the reflective sheeting shall be approximately 38 inches above the surface of the adjacent roadway, and shall be placed as close as possible to the roadway edge on the front of the guardrail post facing adjacent oncoming traffic. Guardrail reflectors shall be attached to metal guardrail posts with a minimum of two 1/2-inch bolts with washers. For metal guardrail posts, two holes shall be drilled through the post to mount the reflectors. The bolt shall be secured to the metal post with a washer and two nuts. For wood posts, the lag bolts shall be a minimum length of two inches. All post-mounted reflectors shall be mounted level and true.

The color of the reflective portion of the barrier markers and flexible guardrail markers shall conform to the color of the adjacent edge line. Silver-faced reflector tabs shall be installed on the right hand side of all roadways, and yellow-faced tabs shall be installed on the left-hand side of one-way roadways and ramps.

Field application of reflective sheeting on the post-mounted L-shaped barrier markers, guardrail reflector tabs and the flexible guardrail markers will not be allowed. All sheeting shall be applied in the factory by the manufacturer. If the sheeting has been damaged in any way, the contractor shall furnish and install a new marker at no additional cost to the Department.

When guardrail is being constructed, or reconstructed under traffic, the contractor shall conduct its operations so as to constitute the least hazard to the public. All guardrail work shall be performed in the direction of traffic flow. Traffic control shall be provided in accordance with the requirements of Section 701.

905-3.02 Roadway Guardrail:

Guardrail posts shall be set to the line and grade established by the Engineer and spaced as shown on the plans.

Wood and steel posts shall either be driven, or placed in manually or mechanically dug holes; however, driven posts will not be permitted at locations where damage to the curb, gutter, sidewalk, buried items, shoulders or pavement might occur. The Engineer will be the sole judge as to whether driving of posts will be allowed. Driving of posts shall be accomplished in a manner which will prevent battering, burring, separation of the galvanizing from the steel or distortion of the post. Any post which is bent or otherwise damaged to the extent it is unfit for use in the finished work, as determined by the Engineer, shall be removed and replaced at no additional cost to the Department.

Pre-punched pilot holes may be required where wood posts are driven. Pilot holes will not be required where steel posts are driven.

Where pavement is disturbed in the construction of guardrail, the damaged surfacing shall be repaired as approved by the Engineer. Where the top surface of a box culvert is at an elevation which would interfere with full depth post placement, the post shall be placed and anchored in accordance with the requirements of Subsection 905-3.06. Where the top surface of a culvert or other item is at an elevation which would interfere with full depth post placement, the post shall be eliminated and nested steel W-beam shall be placed in accordance with the requirements of Subsection 905-3.09.

Except where a concrete foundation for a post is required, the space around and under the posts placed in manually or mechanically dug holes shall be backfilled with moist soils placed in compacted lifts as approved by the Engineer.

Wood blocks shall be toenailed to the wood post with one 16-penny galvanized nail on each side of the top of the block. Wood or steel blocks shall be set so that the top of the block is

no more than 1/2 inch above or below the top of the post, unless otherwise shown on the project plans.

Rail elements shall be spliced at 25-foot intervals or less. Rail elements shall be spliced at posts unless otherwise shown on the project plans. Where steel posts and blocks are used, back-up plates shall be installed at each post, except at posts where splices are made. Rail elements at joints shall have full bearing. When the radius of curvature is 150 feet or less, the rail elements shall be shop curved.

905-3.03 Guardrail End Terminal Assemblies:

Installation of guardrail end terminal assemblies shall be as shown on the plans, except that the foundation tubes shall conform to ARTBA PTE-05, and shall be 78 inches in length.

Foundation tubes shall be installed with an approved driving head. The tubes shall not be driven with the wood post in place. If approved by the Engineer, foundation tubes may also be installed in drilled holes. When foundation tubes are placed in drilled holes, the space around and under the tubes shall be backfilled with moist soils placed in compacted lifts, as approved by the Engineer. The foundation tube shall not protrude more than four inches above the ground as measured along a five foot cord.

905-3.04 Construct Guardrail from Salvage:

Salvaged guardrail, guardrail terminals, guardrail transitions, end terminal assemblies and other guardrail systems shall be constructed at the locations shown on the project plans and in accordance with the provisions specified herein for new guardrail.

If any salvaged materials are deemed by the Engineer, to be unsuitable for reuse or if the quantities of salvaged materials are insufficient to complete the work, the contractor shall furnish new materials in sufficient quantities to complete the work and the cost of furnishing such materials will be paid for in accordance with the provisions of Subsection 109.04.

Where new bolt holes in rail elements are required, the holes shall be made by drilling or punching. Flame-cut bolt holes will not be permitted.

905-3.05 Reconstruct Guardrail:

Existing guardrail, guardrail terminals, guardrail transitions, anchor assemblies, end terminal assemblies, and other guardrail systems shall be removed and reconstructed at the locations shown on the project plans, and in accordance with the provisions specified herein for new guardrail.

When reconstruct guardrail is specified, posts shall be completely removed and then reconstructed. When guardrail anchor assemblies are removed, the existing concrete foundation shall be fully removed and the hole backfilled with moist soil in compacted lifts, as approved by the Engineer.

All guardrail components requiring removal shall be removed in such a manner as to prevent damage to and minimize the loss of the components.

If any materials designated for reconstruction are deemed by the Engineer to be unsuitable for reuse or if the quantities of existing materials are insufficient to complete the work, the contractor shall furnish new materials in sufficient quantities to complete the work and the cost of furnishing such materials will be paid for in accordance with the provisions of Subsection 109.04. New foundation tubes shall be installed in place of guardrail anchors for all anchor assemblies which are to be reconstructed.

Items designated to be reused which are lost, damaged or destroyed as a result of the contractor's operations shall be repaired or replaced by the contractor at no additional cost to the Department.

Existing posts, blocks, rail elements or hardware which are not required for guardrail reconstruction or which the Engineer deems unsuitable for reconstruction, shall be removed and disposed of as directed by the Engineer.

Where new bolt holes in rail elements are required, the holes shall be made by drilling or punching. Flame-cut bolt holes will not be permitted.

905-3.06 Bolted Guardrail Anchors:

Bolted guardrail anchors shall consist of bolting two steel brackets to the shortened post and to the box culvert roof as shown on the plans.

Where the elevation of the top surface of a concrete box culvert or other similar installation prevents the placement of a post of the specified length, the posts shall be shortened and anchored in accordance with the details shown on the plans.

905-3.07 Rub Rail:

Rub rail shall be installed in accordance with the details shown on the plans.

905-3.08 Guardrail Transitions:

Guardrail transitions to concrete barriers shall be constructed in accordance with the details shown on the plans.

905-3.09 Nested Guardrail:

This work shall consist of furnishing and constructing nested guardrail, Type 1, 2, or 3, including all materials, in accordance with the requirements of the project plans.

Nested guardrail consists of additional steel W-beam sections attached as an appurtenance to guardrail.

905-3.10 Guardrail Terminals:

Installation of guardrail terminals shall be as shown on the plans and as specified in the approved manufacturer's drawings. Guardrail terminals shall be either tangent-type or flare-type, as shown on the plans. Only those tangent-type and flare-type terminals listed in the Special Provisions will be allowed.

905-4 Method of Measurement:

The limits of measurement for the various guardrail items are shown on the plans. Guardrail, of the type shown on the project plans, will be measured by the linear foot along the face of the rail element from center to center of end posts, exclusive of guardrail terminals, guardrail end terminal assemblies, and guardrail transitions.

Tangent-type and flare-type guardrail terminals will be measured by the unit each, including all components and markings required for a complete installation as shown on the plans and in the approved manufacturer’s drawing.

Guardrail end terminal assemblies and guardrail transitions will be measured by the unit each.

Nested guardrail, Type 1, 2, or 3, installed as an appurtenance to new guardrail, shall be measured by the linear foot of additional steel W-beam, installed using guardrail hardware, complete in place and accepted, as shown on the plans.

Bolted anchors for guardrail will be measured by the unit for each post anchored as shown on the plans. One unit will consist of the cut and fitted guardrail post, brackets and hardware.

Rub rail will be measured by the unit for each rail installed.

Constructing the various types of guardrail from salvage will be measured by the linear foot or by the unit each, using the limits of measurement specified for new construction.

Reconstructing the various types of guardrail will be measured by the linear foot, or by the unit each, using the limits of measurement specified for new construction.

905-5 Basis of Payment:

The accepted quantities of guardrail, measured as provided above, will be paid for at the contract unit price per linear foot for the types of guardrail installation designated in the bidding schedule, complete in place, including all guardrail delineation, excavation, backfill and disposal of surplus material.

The accepted quantities of tangent-type and flare-type guardrail terminals, measured as provided above, will be paid for at the contract unit price each, complete in place, including all components and delineation as required, excavation, backfill and disposal of surplus material.

The accepted quantities of guardrail end terminal assemblies, measured as provided above, will be paid for at the contract unit price each, complete in place, including all guardrail components and delineation as required, excavation, backfill, disposal of surplus material, and installation of foundation tubes.

Payment for furnishing and placing earthwork and surfacing material for pavement widening associated with new guardrail and at the flares of guardrail terminals will be measured and paid for under the respective contract items.

The accepted quantities of construct guardrail from salvage, or reconstruct guardrail, measured as provided above, will be paid for at the contract unit price, complete in place, including all new guardrail delineation, removal of existing delineation as necessary, excavation, backfill and disposal of surplus or unusable materials. Payment for reconstructing guardrail anchor assemblies will include all costs for providing and installing new foundation tubes.

The contractor will be paid in accordance with the provisions of Subsection 109.04 for furnishing new posts, blocks, rail elements or hardware to replace components deemed by the Engineer unsuitable for reuse, or to supplement insufficient existing quantities for reconstructing the various types of guardrail, or for constructing the various types of guardrail from salvage.

The accepted quantities of bolted guardrail anchors, measured as provided above, will be paid for at the contract unit price each, and shall be full compensation for the work, complete in place, including steel brackets, hardware, excavation, backfill, removing and replacing surfacing, cutting and fitting steel beam posts or timber posts, drilling anchor bolt holes in steel posts, timber posts and box culverts, and disposal of surplus materials.

The accepted quantities of nested guardrail, Type 1, 2, or 3, measured as provided above, will be paid for at the contract unit price per linear foot, complete in place.

The accepted quantities of rub rail, measured as provided above, will be paid for at the contract unit price each, complete in place, including rub rail, back blockouts, and hardware as required.

The accepted quantities of guardrail transitions to concrete barriers, measured as provided above, will be paid for at the contract unit price each, complete in place, including guardrail, posts, blocks, hardware, terminal connection, excavation, backfill and disposal of surplus material. Concrete barrier that is constructed with a guardrail transition shall be measured and paid for in accordance with the requirements of Section 910 for concrete barrier transition.

SECTION 906 CATTLE GUARDS:

906-1 Description:

The work under this section shall consist of furnishing all materials and constructing new cattle guards or reconstructing existing cattle guards at the locations shown on the project plans or designated by the Engineer, in accordance with the details shown on the plans and the requirements of these specifications.

906-2 Materials:

906-2.01 Concrete:

Concrete shall conform to the requirements of Section 1006 for Class B concrete.

906-2.02 Steel:

Reinforcing bars and structural steel shall conform to the requirements of Section 1003 and Section 1004, respectively. ASTM A 570, Grade 40 steel may be used as an alternate to ASTM A 36 for the fabrication of cattle guard grill rails.

906-2.03 Fencing:

Fence posts and braces shall conform to the requirements of Sections 902 and 903.

906-2.04 Backfill:

Backfill material shall conform to the requirements of Subsection 203-5.

906-2.05 Wood:

Wooden shims shall conform to the requirements shown on the plans.

906-3 Construction Requirements:

Excavation and backfill shall be in accordance with the requirements of Subsection 203-5.

Completed cattle guards shall be well drained.

Cattle guards shall be cast-in-place concrete or, at the option of the contractor, may be precast units. The requirements for precast units may be found in the Special Provisions.

Cattle guards shall be constructed in accordance with the details shown on the plans in reasonably close conformity to the lines and grades established or shown on the project plans. All fence and steel gates required shall be constructed as specified under Section 902 or 903, as applicable.

Painting of structural steel shall be in accordance with the requirements of Section 610. Structural steel shall be painted with one coat of primer (Paint No. 1) in accordance with Section 1002. Painting of fence posts and gates shall be in accordance with the requirements of Section 902 or 903, as applicable.

Existing cattle guards designated on the project plans for reconstruction shall be dismantled to the extent required and in such a manner as to preserve all materials or portions of the existing structure that are acceptable for use in the reconstructed structure. All removed concrete shall be disposed of in accordance with the requirements of Subsection 202-3.03(A).

Cattle guards to be reconstructed shall be constructed as specified herein, except that the materials required shall be salvaged to the extent possible from the existing cattle guards designated on the plans to be reconstructed or removed.

Steel angles providing a bearing surface for each grille unit of a roadway cattle guard and wooden shims under railroad cattle guards shall be set to the required elevations with sufficient accuracy that no rocking under load of a grille unit or tread assembly can be observed and that no gap greater than 1/32 inch exists between any pair of bearing surfaces when the unit or assembly is not under load and is not spiked, welded or otherwise held in place.

The fabrication and connections of grille units, angle units, and other steel elements shall conform to the requirements of Section 604. Either H-10 or H-20 loading will be designated on the project plans.

906-4 Method of Measurement:

Cattle guard, and reconstruct cattle guard will be measured as a unit for each structure.

Cattle guards consisting of a different number of grille units, different "H" loadings, different widths, or being new instead of reconstructed will be measured separately.

906-5 Basis of Payment:

The accepted quantities of cattle guards and reconstruct cattle guards, measured as provided above, will be paid for at the contract unit price each, complete in place, including excavation, structure backfill, structural steel, reinforcing steel, grilles, concrete, painting, wood shims and concrete slabs where required.

Payment for fence or gates will be made as specified under Section 902 or 903, except that posts and braces attached to the cattle guard shall be considered as included in the cost of the cattle guard.

SECTION 907 DAMPPROOFING AND WATERPROOFING CONCRETE SURFACES:

907-1 Description:

The work under this section shall consist of furnishing all materials and dampproofing concrete surfaces or waterproofing concrete structures and joints at the locations shown on the project plans and in accordance with the requirements of the plans and these specifications.

907-2 Materials:

907-2.01 General Requirements:

The materials furnished by the contractor to dampproof or waterproof concrete structures as shown on the plans shall conform to the requirements of this section unless otherwise specified on the project plans or in the Special Provisions. Certificates of Compliance conforming to the requirements of Subsection 106.05 shall be submitted.

All materials shall be delivered in the original packages bearing the manufacturer's brand and label. The manufacturer's label and/or the Certificate of Compliance shall state that the fabric has been saturated with asphalt. Fabrics saturated with coal-tar pitch are not acceptable. Materials shall be delivered on the work site a sufficient time before they are to be used to permit testing and analyzing, if required by the Engineer. The fabric shall be stored in a dry place, and the rolls shall not be stored on end.

907-2.02 Prime Coats:

An asphalt primer conforming to the requirements of ASTM D 41 shall be used.

907-2.03 Mop Coats:

An asphalt which conforms to the requirements of ASTM D 449 Type III, shall be used for the mop coats.

907-2.04 Fabric:

The fabric shall be bituminized cotton fabric conforming to the requirements of ASTM D 173. The fabric shall be saturated with asphalt.

907-3 Construction Requirements:

907-3.01 General:

Bituminous coats shall not be applied in wet weather nor when the ambient temperature is below 50 degrees F. Concrete shall be dry and clean before the prime coat is applied. If bituminous material is used for curing, it may also serve as a priming coat, except that additional primer may be necessary before application of the mop coat. The material for mop coats shall be heated as necessary to aid application, but not above 350 degrees F.

The bitumen shall be heated in kettles equipped with armored thermometers, and stirred frequently.

Primer shall be allowed to cure properly before applying the mop coat. The primer shall be applied without heating at the approximate rate of one gallon per 100 square feet of surface with a three- or four-knot roofing brush. If asphalt primer is too thick to allow easy brushing, the material may be thinned by the addition of a small quantity of gasoline or naphtha.

Work shall be so regulated that at the end of the day all fabric that has been applied will have received a mop coat.

Concrete surfaces not to be dampproofed or waterproofed shall be protected from the spilling or otherwise marring of the surface with the bituminous materials.

907-3.02 Dampproofing:

Concrete surfaces to be dampproofed shall be given an asphalt primer and an asphalt mop coat.

Each coat shall be applied uniformly, fully covering the surface, and shall be thoroughly worked into the surface.

After the primer has cured, the mop coat shall be applied at the rate of approximately 50 pounds per 100 square feet of surface to obtain a thickness of approximately 5/64 inch for the dampproof coating.

Within the areas to be treated, all expansion or construction joints that are not protected with metal seals and which will be covered with earth in the completed structure shall be protected with a single layer or strip of bituminized cotton fabric not less than 12 inches wide. The fabric shall be laid evenly over the joints and in a fresh mopping of asphalt. The fabric shall be pressed into place and shall be smooth and free of creases. Joints in the fabric shall lap 12 inches. After placing, the fabric shall be sealed with a mop coat.

Sections dampproofed shall be protected against mechanical injury and high temperature as soon as possible after application and until final acceptance of the work.

907-3.03 Membrane Waterproofing:

(A) Surface Preparation:

Waterproofing may be used in conjunction with slab protection, sheet metal seals or other protective devices.

Surfaces of concrete to be waterproofed shall be smooth and free from projections which might injure the waterproofing membrane. The surfaces shall be cleaned of dust, dirt, grease and loose particles or any foreign substances and shall be dry prior to placing waterproofing.

The use of compressed air may be required in order to remove dust and loose dirt from corners and joints. Damp surfaces may be dried by covering with a layer of hot sand. The sand shall remain in place one or two hours, after which it shall be removed from enough surface to allow the work to proceed.

After the surfaces of concrete to be waterproofed have been thoroughly cleaned and prior to the first hot mop coat, one coat of primer shall be applied. The primer shall be thoroughly worked into the concrete to give a uniform coating.

(B) Application of Membrane:

Two- or three-ply membrane waterproofing, as specified on the project plans, shall be applied after the primer has cured.

Two-ply membrane waterproofing for the protection of footing construction joints or other designated areas shall consist of two layers of bituminized cotton fabric and three mop coats, placed alternately over the concrete surface previously treated with one coat of primer.

Three-ply membrane waterproofing for the protection of decks and sides of structures or other designated areas shall consist of three layers of bituminized cotton fabric and four mop coats, placed alternately over the concrete surface previously treated with one coat of primer.

The layers of the treated cotton fabric shall be laid so that all edges will lap at least two inches. The line of lap shall in every case be broken with that of the preceding layer of membrane. Each strip shall be laid in a fresh hot mop coat and when the specified number of layers has been laid, the entire surface shall be mopped. If practicable, the laying of the fabric shall begin at the lowest part of the surface to be waterproofed. The surface shall be completely covered with a heavy mop coat before the strip of fabric is put down. The mopping shall be so done that there will be no air bubbles, pockets or spots where the surface shows through. As soon as a strip of fabric has been laid, it shall be pressed into the coat to eliminate air bubbles. Creases in the fabric shall be smoothed out carefully by pulling the fabric. The top mopping shall be of such thickness and be so applied as to seal and cover the fabric completely.

Waterproofing shall be free from punctures, pockets or folds.

Special care shall be taken so that the fabric is completely sealed down at the laps. The waterproofing membrane shall be continuous and unbroken.

At joints in the membrane, the laps shall be at least 12 inches. The fabric for making the lap shall be left unmopped until the joint is completed.

On horizontal surfaces, not less than four gallons in each mop coat shall be used for each 100 square feet of surface, and on vertical surfaces, not less than five gallons in each mop coat shall be used for each 100 square feet of surface.

Expansion and contraction joints shall be covered with membrane waterproofing as required by the plans.

Sections waterproofed shall be protected against mechanical injury, high temperature and chemical action, as soon as possible after application and until final acceptance of the work.

907-4 Method of Measurement:

The project plans will show the estimated quantity of surface area to be dampproofed and/or waterproofed and the contractor shall assure itself that this estimated quantity is substantially correct.

907-5 Basis of Payment:

No direct payment will be made for Dampproofing and Waterproofing Concrete Surfaces. The cost of furnishing and applying all materials shall be considered as included in the contract price paid for concrete of the class treated.

SECTION 908 CONCRETE CURBS, GUTTERS, SIDEWALKS AND DRIVEWAYS:

908-1 Description:

The work under this section shall consist of furnishing all materials and constructing Portland cement concrete curb, curb and gutter, ramp curb, sidewalk, driveways, and valley gutters at the locations shown on the project plans in accordance with the details shown on the plans and the requirements of these specifications.

908-2 Materials:

908-2.01 Concrete:

Concrete shall be Class B concrete conforming to the requirements of Section 1006.

908-2.02 Expansion Joint Filler:

Expansion joint filler shall be 1/2-inch bituminous or nonbituminous preformed strips conforming to the requirements of Subsection 1011-6.

908-2.03 Concrete Curing Compound:

Curing compound shall be liquid membrane-forming compound conforming to the requirements of AASHTO M 148, Type I, Class A.

908-3 Construction Requirements:

The subgrade shall be constructed in reasonably close conformity to the lines and grades established or shown on the project plans.

Prior to placing concrete curb, curb and gutter, driveway, valley gutter, or sidewalk the material on which they are to be placed shall be compacted to a depth of at least six inches to a density of not less than 95 percent of the maximum density determined in accordance

with the requirements of the applicable test methods of the ADOT Materials Testing Manual as directed and approved by the Engineer.

All soft or unsuitable material shall be removed to a depth of not less than six inches below subgrade and replaced with material approved by the Engineer.

Single curb, curb and gutter, and sidewalk shall be constructed either by the use of conventional fixed forms or by slip-form curb and sidewalk placing machines.

Weather and temperature limitations for the placement of concrete shall be in accordance with the requirements of Subsection 1006-5.

Forms shall be maintained at all times in good condition as to accuracy of shape, strength, rigidity and smoothness of surface. The depth of face forms for concrete curbs shall be equal to the full face height of the curb.

All other forms shall be set to form the full depth of all edges not formed by adjacent concrete. Forms unsatisfactory in any respect shall not be used.

Forms shall be set in reasonably close conformity to the dimensions, lines and grades shown on the project plans or established by the Engineer and be securely staked in position. Clamps, spreaders, and braces shall be used where required to insure rigid forms.

When the roadway section slopes away from the gutter, the slope of the gutter shall be formed to match the roadway cross slope.

The subgrade and forms shall be watered immediately in advance of placing concrete. Concrete shall be placed in the forms and thoroughly consolidated. The concrete shall be consolidated by means of approved mechanical vibrators or by tamping or spading by hand. The fresh concrete shall be struck off so the surface will be at the proper elevation when the concrete is consolidated. Concrete shall be thoroughly worked so that the coarse aggregate is below the surface. The surface shall then be finished to grade and cross-section with a float, troweled smooth and then given a final fine brush finish.

The exposed edges shall be tooled to a 1/4-inch radius unless a larger radius is indicated on the plans. When concrete placed in curb has set sufficiently so that it will not slump, the front face form shall be removed. The gutter, front face, and top of curb shall be troweled smooth and then given a final fine brush finish with brush strokes parallel to the lines of curb and gutter. The exposed edges shall be tooled to a 1/4-inch radius.

Expansion joints shall be constructed at tangent points of curb returns, at structures, and at a maximum of 60-foot intervals. Expansion joints shall be constructed between sidewalks and driveways, between sidewalks and abutting structures, around poles, posts, boxes, and other fixtures that protrude through the sidewalk. Expansion joints shall match as nearly as possible the joints in the adjacent pavement or existing concrete curb and sidewalk. Joint filler shall be placed vertically and extend full depth beginning 3/16 inch below the surface of the concrete being placed. During the placing and tamping of concrete, the filler shall be restrained in its proper position.

Edges of the concrete at expansion joints shall be tooled to a 1/4 inch radius.

Contraction joints (weakened-plane joints) shall be constructed at a maximum of 15-foot intervals in curb and gutter and sidewalks and shall coincide with contraction joints in adjacent pavement or existing concrete curb and sidewalk. A contraction joint shall be constructed along the center of driveway entrances 20 feet in width or greater.

Longitudinal contraction joints shall be constructed in the center of sidewalk having a width greater than seven feet. Contraction joints shall either be formed or sawed. Formed contraction joints shall be constructed by parting the large aggregates in the fresh concrete with a straightedge to a depth of two inches. The final joint finishing shall be accomplished with a jointer tool having a radius of 1/4 inch leaving a finished joint depth of a minimum of 3/4 inch. Sawed joints shall be sawed to a depth of two inches or one-third the thickness of the concrete, whichever is greater.

Scoring lines, where required, shall have a minimum depth of 1/4 inch and a radius of 1/8 inch. Where longitudinal scoring lines are required, they shall be parallel to, or concentric with, the lines of the work.

Forms shall be thoroughly cleaned each time they are used and shall be coated with a light oil as required to prevent the concrete from adhering to them.

If slip-form equipment is used to construct curb and gutter and sidewalk, such equipment shall be designed specifically for the work. The results shall be equal to or better than that produced by the use of fixed forms. If the results are not satisfactory to the Engineer, the use of the equipment shall be discontinued. All applicable requirements of construction by use of fixed forms shall apply to the use of slip-form equipment.

The slip-form equipment shall be controlled as to line and grade by means of automatic sensing and control devices such that the machine automatically senses and follows either a taut guide line or other reference, performing any necessary corrective maneuvers in order to establish the correct grade and alignment. The contractor shall set the guide line from survey marks provided by the Engineer.

Immediately following the required finishing operations, one or more applications of curing compound shall be applied to all exposed surfaces.

The curing compound shall be applied at the rate of not less than one gallon per 150 square feet of surface area, and in such manner as to entirely cover and seal all exposed surfaces of concrete with a uniform film.

The surface of concrete sidewalk shall be tested with a 10-foot straightedge. Any deviation in excess of 1/4 inch shall be corrected at no additional expense to the Department.

The face, top, back, and flow line of the curb and gutter shall be tested with a 10-foot straightedge or curve template, longitudinally along the surface.

Any deviation in excess of 1/4 inch shall be corrected at no additional expense to the Department.

No vehicular traffic will be allowed on driveways until the concrete has reached at least 60 percent of the required 28-day strength.

Before acceptance of the work, all curb and gutter and sidewalk shall be cleaned of all discolorations resulting from the contractor's operations, including, but not limited to, dirt, stains, bitumens, and equipment tire marks. Cleaning may be by abrasive blast methods or by other methods approved by the Engineer.

908-4 Method of Measurement:

Concrete single curb and curb and gutter will be measured by the linear foot along the flow line. Lengths occupied by catch basins will be excluded from the measurement. No measurement will be made for ramp curb.

Concrete sidewalks, driveways, and valley gutter will be measured by the square foot of area constructed. Areas occupied by catch basins will be excluded from the measurement.

908-5 Basis of Payment:

The accepted quantities of concrete single curb, curb and gutter, valley gutter, sidewalk, and driveway, measured as provided above, will be paid for at the contract unit price per linear foot or square foot, which price shall be full compensation for the work, complete in place, including furnishing and placing embankment material, excavating, removing unstable material, backfilling and compacting.

No payment will be made for ramp curbs, the cost being considered as included in the price of contract items.

SECTION 909 SURVEY MONUMENTS:

909-1 Description:

The work under this section shall consist of furnishing all materials and installing concrete monuments, including cast iron frames and covers; furnishing cast iron frames and covers; or removing and resetting existing frames and covers at the locations shown on the project plans and in accordance with the details shown on the plans and the requirements of these specifications.

909-2 Materials:

909-2.01 Concrete:

Concrete shall be utility concrete conforming to the requirements of Section 922. The standard marker will be furnished by the Department.

909-2.02 Frames and Covers:

Frames and covers shall conform to the requirements of Subsection 505-2.05.

909-3 Construction Requirements:

909-3.01 Survey Monuments:

Excavation for new monuments shall be the depths designated on the plans. The monuments shall be backfilled with suitable material tamped into place to provide a stable and secure installation. The concrete base, cast iron frame, bituminous mix and cover shall then be placed as detailed on the plans. The frame and cover shall be installed in a manner similar to that required under Subsection 505-3.01.

909-3.02 Frames and Covers:

New frames and covers shall be installed as specified under Subsection 909-3.01.

909-3.03 Reset Frames and Covers:

Existing frames and covers to be reset shall be carefully removed and reset as specified under Subsection 909-3.01; however, at the contractor's option and with approval of the Engineer, adjustable extension rings conforming to the requirements of Subsection 505-3.03 may be used. Frames and covers broken or damaged in removing and resetting shall be replaced at no additional cost to the Department.

909-4 Method of Measurement:

Survey monuments will be measured as a unit for each survey monument, including frame and cover; for each frame and cover; or for each existing frame and cover removed and reset.

909-5 Basis of Payment:

The accepted quantities of survey monuments, frame and cover for survey monument and reset frame and cover for survey monument, measured as provided above, will be paid for at the contract unit price each, complete in place, including excavating and backfilling.

SECTION 910 CONCRETE BARRIERS:

910-1 Description:

The work under this section shall consist of furnishing all materials and constructing Portland cement concrete barriers at the locations shown on the project plans and in accordance with the details shown on the plans and the requirements of these specifications.

910-2 Materials:

Unless otherwise shown on the plans, concrete shall be Class S Portland cement concrete conforming to the requirements of Section 1006 with a compressive strength of at least 3,000 pounds per square inch at 28 days.

Reinforcing steel shall be in accordance with the requirements of Section 1003.

Dowels shall be corrosion resistant coated dowel bars conforming to the requirements of AASHTO M 254, Type A.

Grout for pressure grouting the joints of precast barrier shall conform to the requirements of Subsection 602-2.03.

Grout for the bedding of precast barrier shall conform to the requirements of Subsection 913-2.04.

Joint sealant barrier shall be latex sealing compound conforming to the requirements of ASTM C 834, applied as recommended in ASTM C 1193.

910-3 Construction Requirements:

910-3.01 General:

Unless otherwise required by the project plans or Special Provisions, concrete barrier shall be constructed by any of the following methods or combinations thereof, at the contractor's option:

(A) Cast-in-place by slip-form or extrusion
(B) Cast-in-place by fixed forms
(C) Precast

Concrete barriers shall present a smooth, uniform appearance in their final position, conforming to the horizontal and vertical lines shown on the project plans or ordered by the Engineer.

When concrete barriers are to be constructed on recently completed bridges, the barriers shall be placed after falsework has been released and as long after superstructure construction as the progress of the work will permit, unless otherwise ordered by the Engineer.

Concrete barriers and concrete barrier transitions which are constructed on bridge structures and retaining walls shall be constructed by cast-in-place, fixed-form methods. Precast or slip-form methods will not be allowed.

Where concrete barrier is not placed on pavement, the supporting material shall be shaped and finished in reasonably close conformity to the lines, grades and dimensions established by the Engineer or shown on the project plans.

The material shall be compacted to at least 95 percent of the maximum density determined in accordance with the requirements of the applicable test methods of the ADOT Materials Testing Manual, as directed and approved by the Engineer.

All exposed surfaces shall be given a Class II finish in accordance with the requirements of Subsection 601-3.05. Curing of concrete shall be in accordance with the requirements of Subsection 1006-6.

Barrier markers shall be installed in accordance with the details shown on the plans.

910-3.02 Cast-In-Place by Slip Form or Extrusion:

(A) General:

Concrete barriers constructed by using an extrusion machine or similar equipment shall be of well compacted, dense concrete. At the option of the contractor, concrete may be made with materials continuously batched by volume and mixed in a continuous mixer in accordance with the requirements of AASHTO M 241, except that sampling, testing, and acceptance of the concrete will be in accordance with the requirements of Section 1006. The contractor may be required to furnish evidence of successful operation of the extrusion machine or other equipment.

Slip form or extruded barrier will be considered not to require additional finishing if the surface meets the requirements of a Class II finish as described in Subsection 601-3.05 and the alignment is satisfactory. If the extruded barrier does not meet these requirements, operations shall be stopped until adjustments are made to the equipment or the concrete mix that will result in an acceptable product. Barrier that cannot be refinished to meet the specifications for a Class II finish shall be removed and replaced at the contractors expense. Barrier that has unsatisfactory alignment and straightedge tolerance shall be penalized or replaced in accordance with these specifications.

The concrete shall be vibrated, rammed, tamped or worked with suitable equipment until the concrete has been consolidated in order to eliminate voids such as honeycombed surfaces. Further, the equipment shall be operated under sufficient uniform restraint to the forward motion to produce the required consolidation.

The concrete shall be of such consistency that after extrusion it will maintain the shape of the barrier without support.

The grade for the top of the concrete barrier shall be indicated by an offset guide line set by the contractor from survey marks established by the Engineer. The forming portion of the extrusion machine shall be readily adjustable vertically during the forward motion of the machine to conform to the predetermined grade line. A grade line gauge or pointer shall be attached to the machine in such a manner that a continual comparison can be made

between the barrier being placed and the established grade line as indicated by the offset guide line.

In lieu of the above method for maintaining the barrier grade, the extrusion machine may be operated on rails or forms or on existing pavement.

(B) Dimensional Tolerances:

(1) The top of exposed faces of the barrier shall comply with the following tolerances to be accepted at 100 percent of the unit price bid per linear foot.

(a) When a 10-foot long straightedge is placed on the top surface of the barrier, it shall not vary by more than 1/4 inch from the straightedge.

(b) When a 10-foot straightedge is placed along the face of the barrier, it shall not vary by more than 1/2 inch from the straightedge.

(c) The horizontal alignment shall not deviate by more than that allowed in Section 401 when placed adjacent to Portland Cement Concrete Pavement.

All other barrier dimensions shall not deviate by more than 1/2 inch from plan alignment.

(2) The top and exposed faces of the barrier shall comply with the following tolerances to be accepted at 75 percent of the unit price bid per linear foot.

(a) When a 10-foot long straightedge is placed on the top surface of the barrier, it shall not vary by more than 1/2 inch from the straightedge.

(b) When a 10-foot long straightedge is placed along the face of the barrier, it shall not vary by more than 3/4 inch from the straightedge.

(c) The horizontal alignment shall not deviate by more than that allowed in Section 401 when placed adjacent to Portland Cement Concrete Pavement.

All other barrier dimensions shall not deviate by more than 3/4 inch from plan's alignment.

Those portions of the barrier not in compliance with the minimum requirements specified herein to be accepted at 75 percent of the unit price shall be removed and replaced at no additional cost to the Department.

910-3.03 Cast-In-Place by Fixed Forms:

Concrete barrier cast-in-place with fixed forms shall be constructed and cured in accordance with the requirements of Section 601. If new or like new metal or wood forms are used and it is apparent, after the forms are stripped, that special care has been taken to produce uniformly textured surfaces with pleasing appearance, the Engineer may waive the specified additional finishing to produce a Class II finish.

The barrier shall be cast in sections of the length shown on the project plans and the edges of the joints between sections shall be rounded to a 1/4-inch radius.

After the concrete has cured for seven days, the joint shall be filled to a depth of at least one inch with joint sealant.

When a 10-foot long straightedge is placed on the top and along the faces of the barrier, the surface shall not vary more than 1/4 inch from the straightedge.

910-3.04 Precast:

Precast concrete barrier shall be cast in accordance with the requirements of Section 601.

After precast barrier has been approved for use on the project, no additional concrete finishing will be required. Should the finish of precast barrier be marred or damaged as a result of transporting or handling, the Engineer may reject it or allow refinishing. If refinishing is allowed, the resulting surface shall be of uniform texture and appearance and shall match the adjoining sections.

Each section of barrier shall be set on a layer of fresh and plastic grout at least one inch deep, so that grout is exuded for the full length on both sides of the base when the section is set to the true line and grade.

After adjacent sections of barrier have been doweled and set firmly in final position, the joint between them shall be filled with joint sealant to a depth of one inch, up both sides but not across the top. After the joint sealant has set firmly enough to withstand the grouting pressure, grout shall be forced into the pressure grout hole until it flows from the top of the joint.

When a 10-foot long straightedge is placed on the top and along the faces of the barrier, the surface shall not vary more than 1/4 inch from the straightedge.

910-4 Method of Measurement:

Concrete barrier will be measured by the linear foot along the center line of its top surface.

The measurement of the total length of the concrete barrier will not include any part which is within a length as shown on the project plans as a guardrail transition, as an impact attenuator, or as part of the structure of a bridge and extending between the stations of the ends of the bridge wing walls on the same side of the roadway. Sections of concrete barrier that transition from one shape, or type, to another shape, or type, and concrete barrier for

guardrail transition, shall be measured by the unit each of concrete barrier transition that is not part of a structure.

910-5 Basis of Payment:

The accepted quantities of concrete barrier, measured as provided above, will be paid for at the contract unit price per linear foot, complete in place.

No measurement or direct payment will be made for any concrete barrier which is included as part of a bridge structure. Concrete barrier included as part of a bridge structure quantity will be paid for under the lump sum bridge item.

No measurement or direct payment will be made for barrier markers, the cost being considered as included in the cost of the concrete barrier, paid either by the linear foot or as part of a structure.

The accepted quantities of concrete barrier transition, measured as provided above, will be paid at the contract unit price per each, which price shall be full compensation for the work, complete in place, including excavation, backfill, caissons, structural concrete, reinforcing steel, anchors, anchor assemblies, and dowels. Guardrail attached to concrete barrier will be paid for in accordance with the requirements of Subsection 905-5.

SECTION 911 RIGHT-OF-WAY MARKERS:

911-1 Description:

The work under this section shall consist of furnishing all materials and installing new right-of-way markers, including reference markers, or removing and resetting existing right-of-way markers, at the locations shown on the project plans and the requirements of these specifications.

911-2 Materials:

911-2.01 Concrete:

Concrete shall be utility concrete conforming to the requirements of Section 922.

911-2.02 Steel:

Steel shall conform to the requirements of AASHTO M 183 for structural carbon steel.

911-2.03 Paint:

Paint shall be of the types specified on the plans and shall conform to the requirements of Section 1002.

911-3 Construction Requirements:

Right-of-way markers shall consist of a survey monument and a reference marker. The survey monument shall be cast-in-place concrete with a standard marker cap. The standard marker cap will be furnished by the Department.

Excavation for right-of-way markers shall be to the dimensions shown on the plans. Concrete shall be placed in accordance with the requirements of Section 922 and the standard marker set in the fresh concrete.

The right-of-way markers and reference markers shall be set vertically in the ground. The reference markers shall be painted and lettered as shown on the plans.

Existing right-of-way markers, including reference markers, designated for removal and resetting shall be carefully removed and reset at the new locations in the manner specified herein for right-of-way markers. If required, the reset reference markers shall be painted as specified on the plans for new reference markers. Markers broken or damaged in removing and resetting shall be replaced at no additional cost to the Department.

911-4 Method of Measurement:

Right-of-way markers will be measured as a unit for each marker, including reference markers.

Reset right-of-way markers will be measured as a unit for each marker, including reference marker, removed and reset at the new location. Markers removed but not reset will not be included in the measurement.

911-5 Basis of Payment:

The accepted quantities of right-of-way markers and reset right-of-way markers, measured as provided above, will be paid for at the contract unit price each, complete in place.

SECTION 912 SHOTCRETE:

912-1 Description:

The work under this section shall consist of furnishing all materials and applying shotcrete on prepared surfaces at the locations and in accordance with the details shown on the plans and the requirements of these specifications.

Shotcrete shall be mortar or concrete conveyed through a hose and pneumatically applied using either the dry mix process or the wet mix process.

The dry mix process shall consist of thoroughly mixing a proportional combination of dry fine aggregate and Portland cement; conveying the mixture through a delivery hose to a special nozzle where water is added and mixed with the other materials immediately prior to its discharge from the nozzle. The wet mix process shall consist of premixing by

mechanical methods a proportional combination of Portland cement, aggregate and water required to produce mortar or concrete; conveying the mortar or concrete through the delivery hose to the special nozzle where additional compressed air is added at the nozzle prior to its discharge.

912-2 Materials and Equipment:

912-2.01 Portland Cement and Water:

Portland cement and mixing water shall conform to the requirements of Section 1006.

912-2.02 Aggregate:

(A) Fine Aggregate:

Fine aggregate shall conform to the requirements of Subsection 1006-2.03(B), except that it shall conform to the following gradation:

Sieve Size	Percent Passing
3/8 inch	100
No. 4	95 - 100
No. 8	80 - 100
No. 16	50 - 85
No. 30	25 - 60
No. 50	10 - 30
No. 100	2 - 10

(B) Coarse Aggregate:

Coarse aggregate shall conform to the requirements of Subsection 1006-2.03(C), except that it shall conform to the following gradation:

Sieve Size	Percent Passing
1/2 inch	100
3/8 inch	85 - 100
No. 4	0 - 30
No. 8	0 - 10
No. 16	0 - 5

912-2.03 Admixtures:

Admixtures may be used with the premixed mortar or the concrete and shall conform to the requirements of Subsection 1006-2.04.

912-2.04 Reinforcing Steel:

Reinforcing steel bars or welded wire fabric shall conform to the requirements of Section 1003.

912-2.05 Equipment:

Equipment for use with the dry mix process shall be capable of metering the aggregate-cement mixture into the delivery hose under close control and delivering a continuous smooth stream of uniformly mixed material at the proper velocity to the discharge nozzle. The nozzle shall be equipped with a manually operated water ring for directing an even distribution of water through the fine aggregate-cement mixture. The water ring shall be capable of ready adjustment to vary the quantity of water.

Equipment for use with the wet mix process shall be the pneumatic feed type; however, a positive displacement type may be used if permitted in writing by the Engineer. The pneumatic feed type shall be capable of discharging the premixed mortar accurately, uniformly and continuously through the delivery hose and to the gunning nozzle. The nozzle shall be fitted with an air ring for injecting additional compressed air into the premixed material flow. The size of the delivery hose shall be within the range of 1-1/4 to 2-1/2 inches.

912-2.06 Air Supply:

The air compressor shall have ample capacity to furnish an adequate supply of clean dry air for maintaining sufficient nozzle velocity for all phases of the work while simultaneously operating a blow pipe for clearing away the rebound. The air hose shall be equipped with a filter to prevent any oil or grease from contaminating the shotcrete.

A constant air pressure of not less than 80 pounds per square inch shall be maintained in the placing machine when using the dry mix process or at the nozzle when using the wet mix process and when the delivery hose length is 100 feet or less. The pressure shall be increased at least five pounds per square inch for each additional 50 feet of hose or fraction thereof.

912-3 Construction Requirements:

912-3.01 Proportioning and Mixing:

(A) Dry Mix Process:

Dry mix material shall consist of one part Portland cement to not more than four parts fine aggregate measured either by weight or by volume. The fine aggregate shall contain not less than three percent nor more than six percent moisture by weight.

The cement and fine aggregate shall be thoroughly mixed before being charged into the delivery equipment. If the contractor uses a drum-type mixer, the mixing time shall be not less than one minute. The mixed material shall be utilized promptly after mixing and any material that stands more than 45 minutes will be rejected and removed from the work site.

(B) Wet Mix Process:

(1) Premixed Mortar:

Premixed mortar shall consist of not less than 6.0 sacks of Portland cement per cubic yard, fine aggregate and water mixed to a desired consistency, generally to a slump in the range of 1-1/4 to four inches.

The material may be mixed at a central mixing plant or at the project site. If mixing is done at the project site, the mixer shall be capable of thoroughly mixing the specified materials in sufficient quantity to maintain continuous placing of the mortar.

(2) Concrete:

Unless otherwise specified in the Special Provisions, the contractor shall determine the mix proportions and shall furnish concrete for pneumatic placement which contains a minimum of 658 pounds of Portland cement per cubic yard of concrete and which attains a minimum 28-day compressive strength of 3,000 pounds per square inch. Fine aggregate and coarse aggregate shall conform to the requirements of Subsection 912-2.02. The total mix shall contain, by weight, 15 to 20 percent coarse aggregate. In no case shall the slump be greater than four inches.

If ready-mixed concrete is used, it shall conform to the requirements of ASTM C 94.

912-3.02 Preparation of Surfaces:

The surfaces on which shotcrete is to be placed shall be finely graded to the lines and grades shown on the project plans or established by the Engineer. The surfaces shall be thoroughly compacted and shall be uniformly moistened so that water will not be drawn from the freshly placed shotcrete.

912-3.03 Forms and Ground Wires:

Forms shall be of plywood sheathing or other suitable material and shall be true to line and grade and sufficiently rigid to resist deflection during placement of the shotcrete. Forms shall be constructed to permit the escape of air and rebound during the gunning operation.

Ground or gauging wires shall be installed where necessary to establish the thicknesses, surface planes and finish lines of the shotcrete.

912-3.04 Steel Reinforcement:

Steel reinforcement shall be as shown on the project plans and shall conform to the requirements of Section 605.

912-3.05 Placement:

The velocity of the shotcrete as it leaves the nozzle shall be maintained uniform and at a rate approved by the Engineer for the given job conditions. The nozzle shall be held perpendicular to the working surface and at a proper distance, generally between two and five feet, to insure maximum compaction with minimum rebound of the shotcrete.

Rebound or previously expended material in the shotcrete mix shall not be used in any portion of the work. All rebound shall be removed prior to final set and before placement of the shotcrete on adjacent surfaces.

Shotcrete shall not be applied during any precipitation which is of sufficient intensity to cause the in-place shotcrete to run. Shotcrete shall not be applied during wind conditions that cause separation of the nozzle flow.

Shotcrete shall not be applied when a descending ambient air temperature falls below 40 degrees F nor until an ascending air temperature rises above 35 degrees F. Temperature shall be taken in the shade away from artificial heat.

912-3.06 Quality Control Testing:

Tests to determine the physical quality of the shotcrete will be performed by the Engineer periodically during the work as required. Test panels and cores shall be prepared by the contractor.

Test panels at least 12 inches square and as thick as the structure being constructed but not less than three inches shall be prepared by gunning shotcrete mix on a flat piece of plywood. Cores shall be taken from the panels for compressive strength tests and for visual examination. Cores shall have a minimum diameter of three inches and an L/D ratio of at least one. Test panels shall be cured in the same manner as the production work.

Cores shall be obtained and tested in accordance with the requirements of AASHTO T 24. The cores will be tested for a minimum compressive strength of 3,000 pounds per square inch at 28 days.

The cut surfaces of the test specimens will be carefully examined for soundness and uniformity of the material and shall be free from laminations and sand pockets.

912-3.07 Construction Joints:

Construction joints shall be tapered to a shallow edge form one inch thick over a width of one foot, except where the joint will be subjected to compressive strength. If such is the case, square joints shall be constructed and special care taken to avoid or remove trapped rebound at the joint. The entire joint shall be thoroughly cleaned and wetted prior to the application of additional shotcrete.

912-3.08 Finishing:

After the shotcrete has been placed as nearly as practicable to the required thickness and shape outlined by forms and ground wires, the surface shall be checked with a straightedge

and any low spots or depression shall be brought up to proper grade by placing additional shotcrete in such a manner that the finished surface shall be smooth and uniform.

Unless otherwise specified in the Special Provisions, the surface of the shotcrete shall have a natural gun finish.

912-3.09 Curing:

The shotcrete surfaces shall be kept continuously moist for at least seven days, beginning immediately after finishing, by means of either a water spray or fog system capable of being applied continuously or by liquid membrane-forming compound or by polyethylene sheeting conforming to the requirements specified in ASTM C 171.

If polyethylene sheeting is used, it shall be white opaque and adjoining sheets shall overlap at least 12 inches and the laps secured to provide an airtight and windproof joint. If liquid membrane-forming compound is used it shall be Type I conforming to the requirements of ASTM C 309 and the application rate shall be one gallon per 100 square feet.

912-4 Method of Measurement:

Shotcrete will be measured by the square yard of surface areas placed to the required thickness.

No measurement will be made of unexposed surfaces such as support slabs at joints, integral curb faces or cut-off walls.

912-5 Basis of Payment:

Payment for shotcrete will be made at the contract unit price per square yard, complete in place, including excavating, backfilling, fine grading and reinforcement.

SECTION 913 BANK PROTECTION:

913-1 Description:

The work under this section shall consist of furnishing all materials and constructing bank protection in accordance with the details shown on the plans and the requirements of these specifications.

Bank protection shall be dumped riprap, grouted riprap, wire tied riprap, riprap in wire baskets or gabions, and other types of bank protection and shall be constructed at the locations and as shown on the project plans.

913-2 Materials:

913-2.01 Rock:

(A) General:

Rock shall be sound and durable, free from clay or shale seams, cracks or other structural defects. The Bulk Specific Gravity (SSD) shall be determined in accordance with the requirements of AASHTO T 85 and shall be a minimum of 2.4. Rock used to construct dumped riprap shall be angular in shape. Rock used to construct other types of bank protection may be rounded stones or boulders. Rock shall have a least dimension not less than one-third of its greatest dimension and a gradation in reasonable conformity with that shown herein for the various types of bank protection. Control of the gradation will be by visual inspection.

When a source of rock is designated, it shall be the contractor's responsibility to negotiate for the material, obtain the right-of-way and pay all royalties and damages.

The source from which the stone will be obtained shall be selected well in advance of the time when it will be required in the work. The acceptability of the stone will be determined by the Engineer. If testing is required, suitable samples of stone shall be taken in the presence of the Engineer at least 25 days in advance of the time when its use is expected to begin. The approval of some rock fragments from a particular quarry site shall not be construed as constituting the approval of all rock fragments taken from that quarry.

(B) Grouted Riprap:

Gradation of the rock for grouted riprap shall be as specified in the Special Provisions or as shown on the project plans.

(C) Wire Tied Riprap:

Rock for wire tied riprap shall be well graded with at least 95 percent, by weight, exceeding the least dimension of the wire mesh opening. The maximum size stone, measured normal to the mat, shall not exceed the mat thickness.

(D) Dumped Riprap:

Gradation of the rock for dumped riprap shall be as shown on the project plans or as specified in the Special Provisions.

The contractor shall provide two samples of rock of at least five tons each, meeting the gradation specified above. The sample at the construction site may be a part of the finished riprap covering. The other sample shall be provided at the quarry. These samples shall be used as a frequent reference for judging the gradation of the riprap supplied. Any difference of opinion between the Engineer and the contractor shall be resolved by dumping and checking the gradation of two random truck loads of stone.

Mechanical equipment, a sorting site, and labor needed to assist in checking gradation shall be provided by the contractor at no additional cost to the Department.

(E) Gabions:

Rock for gabions shall be well graded, varying in size from four to eight inches.

(F) Riprap (Slope Mattress):

Rock for slope mattress shall be well graded with 70 percent, by weight, exceeding four inches. The maximum dimension of a single stone shall not exceed the least dimension of the gabion.

Broken concrete may be used upon approval of the Engineer.

(G) Rail Bank Protection:

Rock used to construct rail bank protection shall be as specified in the Special Provisions or as shown on the plans.

913-2.02 Metal Items:

(A) Wire Fabric:

Welded wire fabric shall be galvanized and shall conform to the requirements of AASHTO M 55, except that the minimum weight of the zinc coating shall be 0.15 ounces per square foot of actual surface.

Woven wire fabric shall be galvanized and shall conform to the requirements of ASTM A 116, except that the minimum weight of the zinc coating shall conform to the requirements of ASTM A 641, Class 3.

Wire fabric shall be of the diameter, spacing, pattern, and dimensions shown on the plans. The selvage on each sheet of mesh shall be galvanized steel wire with a diameter about 25 percent larger than that used in the body of the mesh.

Certificates of Compliance conforming to the requirements of Subsection 106.05 shall be submitted.

(B) Miscellaneous Fittings and Hardware:

Miscellaneous fittings and hardware shall be of the type and size provided by the manufacturer of the major item to which they apply and shall be galvanized in accordance with the requirements of AASHTO M 232.

Certificates of Compliance conforming to the requirements of Subsection 106.05 shall be submitted.

(C) Tie Wires:

Tie wires shall be of good commercial quality and the size shall be as shown on the project plans, except that the minimum weight of the zinc coating shall conform to the requirements

of ASTM A 641, Class 3. At the option of the contractor, approved wire fasteners may be used on gabions, slope mattresses, or wire fabric in lieu of tie wires.

Certificates of Compliance conforming to the requirements of Subsection 106.05 shall be submitted.

(D) Steel Cable:

Steel cable shall be zinc-coated steel structural wire rope conforming to the requirements of ASTM A 475, seven-wire strand, Class A, for the diameter shown on the plans.

Certificates of Compliance conforming to the requirements of Subsection 106.05 shall be submitted.

(E) Railroad Rail:

Railroad rails may be new or used. If used rails are furnished, they shall be free from rust and equal to at least 95 percent of the original section.

(F) Soil Anchor Stakes:

Soil anchor stakes shall be steel and of the length called for on the plans. When not specified to be railroad rails, the following items may be used: crane rails with a weight of at least 40 pounds per linear foot, two-inch diameter steel pipe conforming to the requirements of ASTM A 53, or 3-inch by 3-inch by 3/8-inch structural steel angles conforming to the requirements of ASTM A 36. Used rails, pipe or angles may be used provided the material is not rusted or damaged to the extent that the strength of the item is reduced to less than 90 percent of a new item of the same type and size.

Certificates of Compliance conforming to the requirements of Subsection 106.05 shall be submitted.

913-2.03 Bedding Material:

Bedding material shall consist of granular material having a maximum dimension of two inches and shall be free of clay or organic material.

913-2.04 Grout:

Grout shall consist of one part Portland cement, three parts fine aggregate and one-fifth part hydrated lime, by volume. These materials shall be thoroughly dry mixed and sufficient water shall be added to provide a mixture of thick workable consistency.

Portland cement, fine aggregate and water shall conform to the requirements of Section 1006. Hydrated lime shall conform to the requirements of ASTM C 207, Type N.

Grout that has been mixed more than one hour shall not be used. Retempering of grout will not be permitted.

913-2.05 Bank Protection Fabric:

Fabric shall be supplied in accordance with and conform to the material requirements of Subsections 1014-1 and 1014-5, respectively. Special attention shall be given to the required survivability of the fabric.

The identification, packaging, handling, and storage of the geotextile fabric shall be in accordance with ASTM D 4873. Fabric rolls shall be furnished with suitable wrapping for protection against moisture and extended ultraviolet exposure prior to placement. Each roll shall be labeled or tagged to provide product identification sufficient to determine the product type, manufacturer, quantity, lot number, roll number, date of manufacture, shipping date, and the project number and name to which it is assigned. Rolls will be stored on the site or at another identified storage location in a manner which protects them from the elements. If stored outdoors, they shall be elevated and protected with a waterproof, light colored, opaque cover. At no time, shall the fabric be exposed to sunlight for a period exceeding 14 days.

913-2.06 Sacked Concrete:

Sacked concrete shall be utility concrete conforming to the requirements of Section 922, except that the minimum cement content shall be 376 pounds per cubic yard; the slump shall be from three to five inches; and the aggregate shall conform to the following gradation when tested in accordance with the requirements of Arizona Test Method 201:

Sieve Size	Percent Passing
2 inch	100
1/4 inch	45-89
No. 200	0-12.0

Sacks for sacked concrete riprap shall be made of at least AASHTO M 182, Class 3, burlap and shall be approximately 19-1/2 by 36 inches measured inside the seams when the sack is laid flat, with an approximate capacity of 1.25 cubic feet. Sound, reclaimed sacks may be used.

913-3 Construction Requirements:

913-3.01 General:

Areas on which bank protection is to be constructed shall be cleared, grubbed, and excavated or backfilled in accordance with the requirements of the appropriate sections of Division II to produce a ground surface in reasonable conformance with the lines and grades shown on the project plans or established by the Engineer.

Placement through water will not be permitted unless otherwise approved by the Engineer.

Areas which are excavated for installation of rail bank protection shall be backfilled to original ground or to the lines and grades shown on the plans.

913-3.02 Bank Protection Fabric:

When fabric is required, it shall be placed in the manner and at the locations shown on the project plans. The surface to receive the fabric shall be free of obstructions, depressions and debris. The fabric shall be loosely laid and not placed in a stretched condition.

The strips shall be placed to provide a minimum 24 inches of overlap for each joint. On horizontal joints, the uphill strip shall overlap the downhill strip. On vertical joints, the upstream strip shall overlap the downstream strip. The fabric shall be protected at all times during construction from extensive exposure to sunlight.

When the maximum size of the rock to be placed on fabric exceeds 18 inches, the fabric shall be protected during the placement of the rock by a layer of bedding material. The bedding material shall be spread uniformly on the fabric to a depth of four inches and shall be free of mounds, dips or windrows. Compaction of the bedding material will not be required.

Rock shall be carefully placed on the bedding material and fabric in such a manner as not to damage the fabric. If, in the opinion of the Engineer, the fabric is damaged or displaced to the extent that it cannot function as intended, the contractor shall remove the rock, regrade the area if necessary, and replace the fabric.

913-3.03 Dumped Riprap:

The rock shall be placed to its specified thickness in one operation and in a manner which will produce a reasonably well graded mass with a minimum amount of voids and with the larger rock evenly distributed throughout the mass.

No method of placing the rock that will cause segregation will be allowed. Hand placing or rearranging of individual rock may be necessary to obtain the specified results.

913-3.04 Wire-Tied Riprap:

After installation of the lower portion of the wire mesh, rock shall be placed in accordance with the requirements of Subsection 913-3.03.

After placement of the rock, the upper portion of the wire mesh shall be placed, laced, and tied in accordance with the details shown on the project plans.

913-3.05 Grouted Riprap:

Rock for grouted riprap shall be placed in accordance with the requirements of Subsection 913-3.03. The stones shall be thoroughly moistened and any excess of fines shall be sluiced to the underside of the stone blanket before grouting.

The grout may be delivered to the place of final deposit by any means that will insure uniformity and prevent segregation of the grout. If penetration of grout is not obtained by

gravity flow into the interstices, the grout shall be spaded or rodded to completely fill the voids in the stone blanket. Pressure grouting shall not unseat the stones, and during placing by this method, the grout shall be spaded or rodded into the voids.

Penetration of the grout shall be to the depth specified on the project plans. When a rough surface is specified, stone shall be brushed until from 25 to 50 percent of the depth of the maximum size stone is exposed. For a smooth surface, grout shall fill the interstices to within 1/2 inch of the surface.

Grout shall not be placed when the descending air temperature falls below 40 degrees F nor until the ascending air temperature rises above 35 degrees F. Temperatures shall be taken in the shade away from artificial heat.

Curing of the grout shall be in accordance with the requirements of Subsection 912-3.09.

At the option of the contractor, shotcrete conforming to the requirements of Section 912 may be furnished in lieu of grout.

913-3.06 Slope Mattress Riprap:

The mattress bed shall be excavated to the width, line and grade as shown on the plans. The mattress shall be founded on this bed and laid to the lines and dimensions required.

Excavation for toe or cut-off walls shall be made to the neat lines of the wall.

Mattresses shall be fabricated in such a manner that the sides, ends, lid and diaphragms can be assembled at the construction site into rectangular units of the specified sizes. Mattresses are to be of single unit construction, the base, ends and sides either to be woven into a single unit or one edge of these members connected to the base section of the unit in such a manner that strength and flexibility at the point of connection is at least equal to that of the mesh.

All perimeter edges of the mattresses are to be securely selvaged or bound so that the joints formed by tying the selvages have at least the same strength as the body of the mesh.

Mattresses shall be placed to conform with the details shown on the project plans. Stone shall be placed in close contact within the unit so that maximum fill is obtained. The units may be filled by machine with sufficient hand work to accomplish the requirements of this specification.

Slope mattresses shall be filled with at least two layers of stone. Broken concrete may be placed in the bottom layer with approval of the Engineer.

Before the mattress units are filled, the longitudinal and lateral edge surfaces of adjoining units shall be tightly connected by means of wire ties placed every four inches or by a spiral tie having a complete loop every four inches. The lid edges of each unit shall be connected

in a similar manner to adjacent units. The slope mattress shall be anchored as shown on the project plans. Each anchor stake shall be fastened to the cover mesh with a tie wire.

913-3.07 Gabions:

The gabion bed shall be excavated to the width, line and grade as shown on the plans. The gabions shall be founded on this bed and laid to the lines and dimensions required.

Excavation for toe or cut-off walls shall be made to the neat lines of the wall.

Gabions shall be fabricated in such a manner that the sides, ends, lid and diaphragms can be assembled at the construction site into rectangular units of the specified sizes. Gabions are to be of single unit construction, the base, ends and sides either to be woven into a single unit or one edge of these members connected to the base section of the unit in such a manner that strength and flexibility at the point of connection is at least equal to that of the mesh.

Where the length of the gabion exceeds its horizontal width, the gabion is to be equally divided by diaphragms, of the same mesh and diameter as the body of the gabions, into cells whose length does not exceed the horizontal width. The gabion shall be furnished with the necessary diaphragms secured in proper position on the base section in such a manner that no additional tying at this juncture will be necessary.

All perimeter edges of gabions are to be securely selvaged or bound so that the joints formed by tying the selvages have at least the same strength as the body of the mesh.

Gabions shall be placed to conform with the project plan details. Stone shall be placed in close contact in the unit so that maximum fill is obtained. The units may be filled by machine with sufficient hand work to accomplish requirements of this specification.

The exposed face or faces shall be hand-placed using selected stones to prevent bulging of the gabion cell and to improve appearance. Each cell shall be filled in three lifts.

Two connecting tie wires shall be placed as shown on the project plans between each lift in each cell. Care shall be taken to protect the vertical panels and diaphragms from being bent during filling operations.

The last lift of stone in each cell shall be level with the top of the gabion in order to properly close the lid and provide an even surface for the next course.

All gabion units shall be tied together each to its neighbor along all contacting edges in order to form a continuous connecting structure.

Empty gabions stacked on filled gabions shall be laced to the filled gabion at the front, side and back.

913-3.08 Sacked Concrete Riprap:

The sacks shall be filled with concrete, loosely packed so as to leave room for folding or tying at the top. Approximately one cubic foot of concrete shall be placed in each sack. Immediately after filling, the sacks shall be placed according to the details shown on the project plans and lightly trampled to cause them to conform with the earth face and with adjacent sacks in place.

The first two courses shall provide a foundation of double thickness. The first foundation course shall consist of a double row of stretchers laid level and adjacent to each other in a neatly trimmed trench. The trench shall be cut back into the slope a sufficient distance to enable proper subsequent placement of the riprap. The second foundation course shall consist of a row of headers placed directly above the double row of stretchers. The third and remaining courses shall consist of a double row of stretchers and shall be placed in such a manner that joints in succeeding courses are staggered.

All dirt and debris shall be removed from the top of the sacks before the next course is laid thereon. Stretchers shall be placed so that the folded ends will not be adjacent. Headers shall be placed with the folds toward the earth face. Not more than four vertical courses of sacks shall be placed in any tier until initial set has taken place in the first course of any such tier.

When there will not be proper bearing or bond for the concrete because of delays in placing succeeding layers of sacks, a small trench shall be excavated back of the row of sacks already in place, and the trench shall be filled with fresh concrete before the next layer of sacks is laid. The size of the trench and the concrete used for this purpose shall be approved by the Engineer. The Engineer may require header courses at any level to provide additional stability to the riprap.

Sacked concrete riprap shall be cured by being covered with a blanket of wet earth or by being sprinkled with a fine spray of water every two hours during the daytime for a period of four days.

913-3.09 Rail Bank Protection:

Excavation, where required for rock fill, shall be performed in reasonably close conformity to the lines and grades established or shown on the plans.

Rails shall be driven at the locations and to the minimum penetrations shown on the plans. Driving equipment shall be capable of developing sufficient energy to drive the rails to the specified minimum penetration and be approved by the Engineer.

If hard material is encountered during driving before minimum penetration is reached and it has been demonstrated to the satisfaction of the Engineer that additional attempts at driving would result in damage to the rails, the Engineer may order additional work to be performed, such as jetting or drilling, in order that minimum penetration may be obtained or the Engineer may order the minimum penetration to be reduced as required by the conditions encountered.

Wire fabric shall be securely fastened to the rails, placed in the trenches and laid on the slopes. The rock backfill shall then be carefully placed so as not to displace the wire fabric or rails. The wire fabric shall entirely enclose the rock backfill.

The completed rock fill shall be backfilled as necessary and the waste material disposed of as directed by the Engineer.

913-4 Method of Measurement:

Riprap, except gabions and sacked concrete, will be measured by the cubic yard of protection constructed by computing the surface area measured parallel to the protection surface and the total thickness of the riprap measured normal to the protection surface.

Riprap (gabions) will be measured by the cubic yard by computing the volume of the rock-filled wire baskets used.

Riprap (sacked concrete) will be measured by the cubic yard of concrete placed in the completed work. The measurement will be based on mixer volumes.

Rail bank protection will be measured by the linear foot. Measurement will be made from top of rail to top of rail (longest rail where rails of two or more lengths are used) and the distance measured will be from end rail to end rail.

Where two parallel rows of vertical rails are used, the measurement for payment will be the average of the distance along the two rows. Rail bank protection will be measured along the bank protection control line from end rail to end rail.

913-5 Basis of Payment:

The accepted quantities of riprap and rail bank protection, measured as provided above, will be paid for at the contract unit price per cubic yard or linear foot, which price shall be full compensation for the work, complete in place, including excavation; preparing the ground area; furnishing and installing the rock, filter fabric, bedding material, metal items, concrete, sacks and grout; and backfilling as required.

Materials, labor and equipment necessary to perform additional work such as jetting or drilling, as specified under Subsection 913-3.09, will be paid for in accordance with the provisions of Subsection 109.04.

SECTION 914 WALLS AND MISCELLANEOUS STRUCTURES:

914-1 Description:

The work under this section consists of furnishing all materials and constructing walls and miscellaneous structures at the locations and in accordance with the details shown on the project plans.

914-2 Materials:

Concrete shall be Class S and of the compressive strength shown on the project plans. Concrete and reinforcing steel shall conform to the requirements of Sections 1006 and 1003, respectively. Masonry materials shall conform to the requirements specified on the project plans.

914-3 Construction Requirements:

Rustication, color coating or other wall treatments shall be in accordance with the details shown on the project plans or as specified in the Special Provisions.

Excavation and backfill shall be in accordance with the requirements of Subsection 203-5.

914-4 Method of Measurement:

Measurement of this work will be made by the square foot of wall constructed and will be measured along the front face of the wall from the top of footing to the top of wall cap.

914-5 Basis of Payment:

Payment for this work will be made at the contract price per square foot, which price shall be full compensation for the item complete, including necessary excavation, footings, backfilling, rustication and color coating as described herein and on the project plans.

SECTION 915 TEMPORARY SILT FENCE:

915-1 Description:

The work under this section shall consist of furnishing, installing, maintaining, and removing a geotextile barrier-fence designed to remove suspended particles from the water passing through it.

The temporary silt fence shall be installed in accordance with the details and at the locations as shown on the project plans. The installation shall be in accordance with the requirements of these specifications except as otherwise directed or approved by the Engineer. The quantity of temporary silt fence to be installed will be affected by the actual conditions which occur during the construction of the project.

915-2 Materials:

915-2.01 Geotextile Fabric:

The silt fence geotextile fabric shall be supplied in accordance with the material requirements of sections 1014-1 and 1014-8.

This specification provides criteria for wire supported geotextile silt fence as well as a self supporting geotextile silt fence.

915-2.02 Fabric Packaging, Handling, and Storage:

The identification, packaging, handling, and storage of the geotextile fabric shall be in accordance with ASTM D 4873. Fabric rolls shall be furnished with suitable wrapping for protection against moisture and extended ultraviolet exposure prior to placement. Each roll shall be labeled or tagged to provide product identification sufficient to determine the product type, manufacturer, quantity, lot number, roll number, date of manufacture, shipping date, and the project number and name to which it is assigned. Rolls will be stored on the site or at another identified storage location in a manner which protects them from the elements. If stored outdoors, they shall be elevated and protected with a waterproof, light colored, opaque cover.

915-2.03 Posts:

Posts shall be a minimum of three feet plus the burial depth in length and may be made of either wood or steel. Soft wood posts shall be at least three inches in diameter, or nominal two-inch by four-inch and straight enough to provide a fence without noticeable misalignment. If oak posts are used, the size may be reduced to 1-1/2 by 1-1/2 inches with a minus tolerance of 1/8 inch, provided that the cross sectional area is a minimum of 2.25 square inches. Steel posts shall have a minimum weight of 1.3 pounds per foot, and have projections for fastening the wire and fabric to the fence.

915-2.04 Wire Support Fence:

Wire support fence shall be a minimum of 32 inches high and shall be 12 gauge steel wire mesh.

915-2.05 Fasteners for Wooden Posts:

Wire staples shall be No. 17 gauge and shall have a crown at least 3/4-inch wide and legs at least 1/2-inch long. Staples shall be evenly spaced with at least five per post.

Nails shall be 14 gauge, one inch long with 3/4-inch button heads. Nails shall be evenly spaced with at least four per post.

915-3 Construction Requirements:

915-3.01 Silt Fence Installation:

The contractor shall install a temporary silt fence as shown on the plans, and at other locations as directed or approved by the Engineer. Fence construction shall be adequate to handle the stress from sediment loading. Geotextile at the bottom of the fence shall be buried a minimum of six inches in a trench so that no flow can pass under the barrier. The trench shall be backfilled and the soil compacted over the geotextile. Fence height shall be as specified by the Engineer but in no case shall exceed 36 inches above ground surface.

915-3.02 Post Installation:

Posts shall be set a minimum of 18 inches into the ground and spaced a maximum of six feet apart. Where an 18-inch post depth is impossible to achieve, the posts should be adequately secured to prevent overturning of the fence due to sediment loading and ponding pressure.

915-3.03 Wire Support Fence:

When wire support fence is used, the wire mesh shall be fastened securely to the upstream side of the post. The wire shall extend into the trench a minimum of two inches and extend a minimum of 32 inches above the original ground surface.

915-3.04 Geotextile Fabric Post Attachment:

The geotextile fabric shall be attached on the upstream side of the posts by wire, cord, button head nails, pockets, staples, or other acceptable means. The geotextile fabric shall be installed in such a manner that eight to ten inches of fabric is left at the bottom to be buried. The fabric shall be installed in the trench such that six inches of fabric is against the side of the trench and two to four inches of fabric is across the bottom of the trench in the upstream direction. The trench shall then be backfilled and compacted so that no flow can pass under the barrier.

A minimum overlap of 18 inches shall be provided at all splice joints with posts at the ends of each fabric roll.

At the time of installation, the fabric will be rejected if it has defects, rips, holes, flaws, deterioration, or damage incurred during manufacture, transportation, storage or installation.

915-4 Maintenance Requirements:

915-4.01 Silt Fence Maintenance:

The contractor shall be responsible to maintain the integrity of silt fences as long as necessary to contain sediment runoff in accordance with Subsection 104.09, or as directed by the Engineer.

915-4.02 Sediment Deposit Removal:

Sediment deposits shall be removed when the deposit reaches approximately one-half the height of the silt fence. The Engineer may also direct the contractor to install an additional silt fence.

915-4.03 Fence Removal:

The silt fence shall remain in place until the Engineer directs that it be removed. Upon removal, the contractor shall remove and dispose of any excess silt accumulations, grade the area to leave a generally smooth appearance, and plant vegetation in the areas specified in the contract documents. The fence materials will remain the property of the contractor and may be used at other locations provided the materials are in a condition acceptable to the Engineer.

915-5 Method of Measurement:

Temporary silt fence will be measured per linear foot. No allowance will be made for extra material used in overlapping at splice joints.

Removal of sediment will be measured by the cubic yard.

915-6 Basis of Payment:

The accepted quantity of temporary silt fence, measured as provided above, will be paid for at the contract unit price per linear foot, complete in place, including all labor, materials, and equipment connected with placing the temporary silt fence as shown on the project plans or as directed by the Engineer. No payment will be made for rejected temporary silt fence, or for patching, due to contamination or damage by the contractor.

The removal of sediment will be paid for at the contract unit price per cubic yard, including the removal and disposal of silt accumulations as provided for in the Special Provisions and the erosion control plan for the project.

SECTION 916 EMBANKMENT CURB:

916-1 Description:

The work under this section shall consist of furnishing all materials and constructing Portland cement concrete embankment curbs at the locations shown on the project plans or otherwise designated in accordance with the details shown on the plans and the requirements of these specifications.

916-2 Materials:

Portland cement, water and admixtures shall conform to the requirements of Section 1006 for Class B concrete.

Fine aggregate and coarse aggregate shall conform to the requirements of Subsection 1006-2.03. The designated size of coarse aggregate shall be No. 7, No. 67 or No. 57. At the option of the contractor, aggregate conforming to the requirements for Aggregate Base, Class 1, as shown in Table 303-1, may be furnished.

The contractor may add additional fine aggregate to the aggregate for the curb in order to facilitate finishing. Fine aggregate for this purpose shall be nonplastic and shall conform to the following grading requirements:

Sieve Size	Passing Percent
No. 4	100
No. 200	0-10.0

Fine aggregate added for this purpose shall not exceed 25 percent of the total aggregate for the concrete curb.

Liquid membrane-forming compound shall conform to the requirements of AASHTO M 148, Type I, Class A.

916-3 Construction Requirements:

The contractor shall be responsible for furnishing the various ingredients and for proportioning and mixing them; however, approval of the proposed materials and proportioning and mixing shall be obtained prior to any concrete operations.

The minimum cement content per cubic yard of concrete shall be 470 pounds.

No field tests will be required on the concrete mixture.

The requirements for mixing and placing concrete in cold weather shall conform to the requirements of Subsection 1006-5.03. There is no maximum temperature limitation on the concrete mixture immediately before placement.

Embankment curb shall be constructed either by the use of conventional fixed forms or by slip-form curb placing machines. The surface on which the curbs are to be placed shall be cleaned of all loose dirt and debris prior to placing. The work shall be performed so as not to mar the roadway surface.

If slip-form equipment is used to construct embankment curb, such equipment shall be designed specifically for the work. The slip-form machine shall be capable of producing curb equal to or better than that produced by the use of fixed forms. If the curb produced by such machines is not acceptable, the use of such machines shall be terminated.

Curbs shall present a neat appearance. The finish normally associated with the use of slip-form curb placing machines, including the use of moveable forms, will be considered as acceptable for the finishing of concrete embankment curb. When bituminous material is being applied to the adjacent roadway, curbs shall be protected so that they are not spattered or discolored.

Embankment curb shall be cured by the application of liquid membrane-forming compound. The time at which it is to be applied and the rate of application shall be approved by the Engineer.

916-4 Method of Measurement:

Embankment curb will be measured by the linear foot of curb placed. Lengths occupied by spillway inlets will be excluded from the measurement.

916-5 Basis of Payment:

The accepted quantities of embankment curb, measured as provided above, will be paid for at the contract unit price per linear foot, complete in place.

SECTION 917 EMBANKMENT SPILLWAYS, EMBANKMENT DOWN-DRAINS, INLETS AND OUTLETS:

917-1 Description:

The work under this section shall consist of furnishing all materials and constructing embankment spillways, embankment down-drains, inlets and outlets at the locations designated on the project plans and in accordance with the details shown on the plans and the requirements of these specifications.

917-2 Materials:

Certificates of Compliance conforming to the requirements of Subsection 106.05 shall be submitted.

Concrete shall be Class B Portland cement concrete conforming to the requirements of Section 1006.

Welded wire fabric and wire ties shall conform to the requirements of Section 1003.

Steel bars for reinforcing, anchor stakes and trash racks shall conform to the requirements of Section 1003.

Miscellaneous structural steel shall conform to the applicable requirements of Section 1004.

Corrugated metal pipe shall conform to the requirements of Section 1010 and shall be fabricated with circumferential corrugations.

Preformed bituminous joint filler shall conform to the requirements of Subsection 1011-6.01.

917-3 Construction Requirements:

917-3.01 General:

Embankment slopes and existing ground at outlets shall be excavated in reasonably close conformity to the lines, and grades shown on the plans or established by the Engineer.

Backfill shall be placed and compacted in accordance with the requirements of Subsection 203-10 for embankment.

917-3.02 Concrete:

Concrete spillways, inlets and outlets shall be constructed in accordance with the requirements of Section 601. Reinforcing with wire mesh or steel bars where shown on the plans shall be placed in accordance with the requirements of Section 605.

Concrete surfaces shall be protected from discoloration.

Preformed bituminous joint material shall be placed around timber guardrail posts imbedded in concrete.

917-3.03 Metal:

Each separate down-drain installation shall be assembled from one type of pipe only. Steel and aluminum shall not be used in the same installation.

Corrugated metal pipe utilized in construction of down-drains shall be installed in accordance with the applicable requirements of Section 501.

917-4 Method of Measurement:

917-4.01 Embankment Spillways and Embankment Down-Drains:

Embankment spillways and embankment down-drains will be measured by the linear foot along the slope at the center line of the spillway and along the metal down-drain parallel to the center line of the pipe.

917-4.02 Inlets and Outlets:

Inlets and outlets will be measured as a unit for each installation of the type specified.

Trash racks will not be measured for separate payment, but will be considered as included in the price bid for inlets.

917-5 Basis of Payment:

The accepted quantities of embankment spillways, embankment down-drains, inlets and outlets, measured as provided above, will be paid for at the contract unit price, complete in place, including excavating and backfilling.

SECTION 918 TURNOUT CONSTRUCTION:

918-1 Description:

The work under this section consists of all necessary surface preparation and the placing, spreading, shaping and finishing of base material, asphaltic concrete, asphaltic concrete friction course or bituminous treatments, as appropriate, for turnouts which are not shown on the project plans or on typical sections, but which generally conform to and are essentially limited by the details shown on the plans.

918-2 Blank

918-3 Construction Requirements:

All materials shall be placed, spread, shaped, compacted and finished in accordance with the construction requirements of the specifications for the specific material.

918-4 Method of Measurement:

Measurement will be made by the square yard and each turnout will be measured to the nearest square yard; however, when surface preparation or a material application is required more than once in the same area, measurement for payment will be made only once of any such area.

918-5 Basis of Payment:

Payment will be made at the contract unit price per square yard, which price shall be full compensation for the work complete in place as described and specified herein.

Payment for furnishing the various materials will be made under the respective contract items.

No payment will be made for turnouts which are shown on the project plans or on typical sections from which dimensions can be taken or can readily be determined.

SECTION 919 CONCRETE GORE PAVING:

919-1 Description:

The work under this section shall consist of furnishing aggregate base, joint filler and Portland cement concrete and constructing gore pavement at the locations and in accordance with the detailed requirements shown on the plans and in the specifications.

919-2 Materials:

919-2.01 Portland Cement Concrete:

Portland cement concrete shall conform to the requirements of Section 1006 for Class B concrete.

919-2.02 Aggregate Base:

Aggregate base shall conform to the requirements of Subsection 303-2 for any of the classes specified therein.

919-2.03 Joint Filler:

Joint filler shall conform to the requirements of Subsection 1011-6.

919-2.04 Curing Compound:

Curing shall be accomplished by any of the methods specified in Subsection 401-3.04(G), except that any method that may permanently discolor concrete shall not be used.

919-3 Construction Requirements:

Where material is to be placed on the existing ground surface or surface or existing subgrade to bring it up to the surface on which the aggregate base material is to be placed, the work shall be in conformance with the requirements of Subsection 203-10.

Aggregate base shall be placed and compacted in accordance with the requirements of Subsection 303-3, except that the final surface need not be fine graded or finished with a leveling device.

Finish on the concrete slab shall be a transverse coarse broom finish. Concrete shall be placed and consolidated in accordance with the requirements of Subsection 401-3.04(D).

919-4 Method of Measurement:

Quantities of concrete gore paving will be measured by the square yard and will be calculated on the basis of the dimensions shown on the project plans.

919-5 Basis of Payment:

The accepted quantities of concrete gore paving, measured as provided above, will be paid for at the contract unit price per square yard. The price shall include full compensation for the work complete in place, including furnishing and placing all needed aggregate base, Portland cement concrete, joint filler and curing compound and all incidental excavation except such excavation of roadway material as is to be paid for as part of the construction of the roadway subgrade on which the aggregate base is to be placed.

SECTION 920 - 921 BLANK:

SECTION 922 UTILITY CONCRETE FOR MISCELLANEOUS CONSTRUCTION:

922-1 Description:

The work under this section shall consist of furnishing all materials, mixing and placing Portland cement concrete for post foundations and anchors for barrier fences, line fences, chain link fences and miscellaneous signs; concrete foundations for depth gauges at fords; concrete for right-of-way markers and survey monuments; concrete rings at ground surface for irrigation valves and gates; concrete fill at the base of electrical pull boxes; and for similar uses as specified on the project plans or in the Special Provisions.

922-2 Materials:

Portland cement, water, admixture, fine aggregate and coarse aggregate shall conform to the requirements of Section 1006. The coarse aggregate size designation shall be chosen by the contractor and be approved by the Engineer and shall conform to the size designation and gradation requirements of AASHTO M 43.

922-3 Construction Requirements:

The Engineer will inspect and approve the facilities, materials, and methods for producing the concrete to insure that concrete of the quality suitable for use in the work will be obtained. Mixing and placing of the concrete shall conform to the requirements of recognized practice. Concrete may be mixed in mobile mixers upon approval of the Engineer.

Mixing and placing concrete in cold weather shall conform to the requirements of Subsection 1006-5.03. There is no maximum temperature limitation for the concrete mixture immediately prior to placement.

The minimum cement content per cubic yard of concrete shall be 470 pounds.

All exposed concrete shall be finished to a smooth surface.

922-4 Method of Measurement:

No measurement will be made of the concrete used.

922-5 Basis of Payment:

No direct payment will be made for furnishing and placing utility concrete. The cost will be considered as included in the price bid for the item of work in which the concrete is incorporated.

SECTION 923 - 924 BLANK:

SECTION 925 CONSTRUCTION SURVEYING AND LAYOUT:

925-1 Description:

The work under this section shall consist of furnishing all materials, personnel, and equipment necessary to perform all surveying, staking, establishment of all pit boundaries, laying out of haul roads, and verification of the accuracy of all existing control points which have been provided by the Department. Included in this work shall be all calculations required for the satisfactory completion of projects, including grade and drain, overlay, safety, landscape, rest areas, structures, surfacing projects, or combinations thereof, in conformance with the plans and these specifications. The work shall include establishing and marking 'as-built' elevations on right-of-way markers, bridges, and culverts. The work shall be done under the direction of a registered professional engineer or a registered land surveyor employed by the contractor. The crew chief shall be NICET Certified Level III or a registered land surveyor. A minimum of 50 percent of the survey crew shall be NICET Certified Level II or possess at least a Land Surveyor-In-Training certificate. All right-of-way monuments and lines shall be established by a registered land surveyor employed by the contractor.

Measurement of all pay quantity items will be the responsibility of the Department.

When utility adjustments are a part of the contract, the contractor shall perform all layout work and set all control points, stakes and references necessary for carrying out all such adjustments.

The contractor shall not employ or engage the services of any person or persons in the employ of the Arizona Department of Transportation for the performance of any of the work as described herein.

925-2 Materials, Personnel and Equipment:

Materials and equipment shall include, but shall not necessarily be limited to, vehicles for transporting personnel and equipment, properly adjusted and accurate survey equipment, straightedges, stakes, flagging, and all other devices necessary for checking, marking, establishing and maintaining lines, grades and layout to perform the work called for in the contract. The contractor shall furnish competent personnel to perform the survey work and layout.

The contractor shall furnish all traffic control, including flagging for survey and staking operations, the cost being considered to be included in contract bid item 9250001, CONSTRUCTION SURVEYING AND LAYOUT. Traffic control devices and procedures for construction surveying shall be in accordance with the requirements of the MUTCD and associated ADOT Supplement.

The Department will furnish field books to be used by the contractor for recording survey data and field notes. These books shall be available for inspection by the Department at any time and shall become the property of the Department upon completion of the work.

925-3 Construction Requirements:

Prior to beginning any survey operations, the contractor shall furnish to the Engineer, for approval, a written outline detailing the method of staking, marking of stakes, grade control

for various courses of materials, referencing, structure control, and any other procedures and controls necessary for survey completion. A part of this outline shall also be a schedule which will show the sequencing of the survey and layout work, throughout the course of the contract, listing a percentage of completion for each month. Section 1100-B, Chapter XI of the ADOT Construction Manual shall be used by the contractor as a guide in the preparation of this outline. The contractor may obtain a copy of Chapter XI, for a fee, from Engineering Records, 1655 West Jackson, Room 112F, Phoenix, AZ 85007; Phone (602) 712-7498.

The Department will provide either traverse or control points for establishing an accurate construction centerline and will establish bench marks adjacent to this line for the proper layout of the work as described herein. Control points will be located on centerline at the beginning and ending of the project, and at all points of curve (P.C.), points of tangent (P.T.), tangents to spiral (T.S.), spirals to tangent (S.T.), and angle points. On long tangents, additional points will be provided for continuity of line.

Traverse points, when provided, will be as follows:

For horizontal control, the Department will run a traverse from which construction centerline can be established. The control points, delineated by iron pins, marks in concrete, or similar devices, will be located to minimize the likelihood of their destruction during construction activities. Coordinates of these points and/or ties to construction centerline will be provided.

For vertical control, the Department will establish bench marks the entire length of the project at horizontal intervals not to exceed 2,500 feet.

Traverse or control points set by the Engineer will be identified in the field to the contractor.

The contractor shall verify the accuracy of the traverse or control points established by the Engineer prior to use. After verification of these points, the contractor shall notify the Engineer in writing of the results of the verification. Throughout the work, the contractor shall set all stakes including centerline stakes; offset stakes; reference point stakes; slope stakes; pavement lines, curb lines and grade stakes; stakes for sewers, roadway drainage, pipe, under drains, clearing, paved gutter, guardrail, fence, right-of-way markers, survey monuments and culverts; blue tops for subgrade, subbase and base courses; control points for bridges, bridge piers, abutments, footings, pile cutoff, pile layout, pier caps, bridge seats, bridge beams, girder profiles and screed elevations; supplemental bench marks; permanent as-built elevation marks; and all other horizontal or vertical controls necessary for complete and accurate layout and construction of the work. The coordinates of any new control points established by the contractor during the course of the work shall be given to the Engineer within five working days of control point establishment.

If errors are discovered during the verification process, and control points do not agree with the geometrics shown in the plans, the contractor shall promptly notify the Engineer in writing, and explain the problem in detail. The Engineer will advise the contractor within five working days of any corrective actions which may be deemed necessary.

Directed changes to the work shall be reimbursed under Subsection 925-5 and additional contract time may be considered for any delays.

The contractor shall be responsible for the proper layout and accuracy of all property markers and right-of-way monuments which are required by the project plans.

Structure sites shall be accurately profiled and cross-sectioned, and structure control points shall be set and checked to assure the proper construction or installation of each structure. Profiles shall be approved by the Engineer prior to constructing or installing each structure. All profile survey data shall be entered in furnished field books and preserved as a permanent project record.

The contractor shall exercise care in the preservation of stakes, references and bench marks and shall reset them when any are damaged, lost, displaced or removed.

On all projects, the centerline layout for the final surface course shall be established by instrument survey by the contractor and shall serve as marks for permanent traffic centerline striping. On projects requiring contractor striping, points at 50-foot intervals shall be set for each traffic lane, crossroad, ramp, frontage road or any other area where striping will be required.

On projects where traffic is being carried through the work zone, pavements shall be marked for traffic centerline delineation before the end of each work shift. Temporary pavement markings shall conform with the requirements set forth under Subsection 701-3.05 of these specifications and any subsequent modifications thereto.

Any discrepancies in grade, alignment, earthwork quantities, locations or dimensions detected by the contractor shall immediately be brought to the attention of the Engineer. No changes in the project plans will be allowed without the approval of the Engineer. Requests for verification of earthwork quantities shall be in accordance with Subsection 203-2.01.

The Department reserves the right to make inspections and random checks of any portion of the staking and layout work. If, in the Engineer's opinion, the work is not being performed in a manner that will assure proper controls and accuracy, the Engineer will order any or all of the staking and layout work redone at no additional cost to the Department.

If any portion of the contractor's staking and layout work is ordered redone, resulting in additional rechecking by the Department, the Department shall be reimbursed for all costs for such additional checking. The amount of such costs will be deducted from the contractor's monthly estimate.

Inspection of the contractor's layout by the Engineer and the acceptance of all or any part of it shall not relieve the contractor of its responsibility to secure the proper dimensions, grades and elevations of the several parts of the work.

Office Survey Work:

The contractor shall be compensated for office work associated with project survey under the following circumstances:

(A) When the project plans fail to provide sufficient information to lay out the project or any part thereof.

(B) When the contractor performs office survey work based on erroneous plans information which results in the duplication of work.

(C) If the Department should change any plans information for which the contractor has already performed office work which results in the duplication of that work.

The contractor shall not be due compensation for any office survey work:

(A) When information provided in the plans is sufficiently complete to allow any additional information necessary for the complete layout of the project to be routinely calculated.

(B) When the contractor fails to inform the Engineer of discovered plan errors prior to the performance of any extra office survey work.

(C) That is included in any other existing pay item.

The contractor shall inform the Engineer in a timely manner of any omissions, ambiguities, or errors which the contractor feels may result in extra office survey work, so as not to delay the project or create any unnecessary calculations.

All office survey work shall be documented by the contractor and verified by the Engineer for compensation. Documentation shall consist of at least a detailed office diary specifically addressing the work involved in the alleged problem area. The contractor may be required to provide the calculations, charts, graphs, drawings, or any other physical evidence which will verify the extra work.

925-4 Method of Measurement:

Construction surveying and layout will be measured as a single complete unit of work.

Two-, three-, and four-person survey parties and office survey technicians will be measured by the hour to the nearest half hour.

925-5 Basis of Payment:

Payment for construction surveying and layout will be by the lump sum and will be made as follows:

The approved schedule showing the sequencing and percentage of the survey and layout work, as submitted under Subsection 925-3, shall be the basis on which

monthly progress payments shall be made. This schedule shall be subject to periodic review, at the request of either party, if the survey and layout work lags or accelerates. If necessary the schedule will be revised to reflect changes in survey and layout progress. When approved, the revised schedule will become the basis of payment.

If additional staking and layout are required as a result of additional work ordered by the Engineer, such work will be paid under ITEM 9250102- TWO-PERSON SURVEY PARTY, ITEM 9250103- THREE-PERSON SURVEY PARTY, ITEM 9250104- FOUR-PERSON SURVEY PARTY, and ITEM 9250105– OFFICE SURVEY TECHNICIAN. Payment will be made at the respective predetermined unit prices specified in the Special Provisions. Should such additional work require the contractor to pay travel and subsistence costs for the survey party or survey parties utilized, payment for travel and subsistence will be made under the provisions of Subsection 109.04, except that no mark-up will be allowed for profit and overhead. The Engineer will be the sole judge as to whether the additional work shall be performed by the contractor or by Department forces.

The amount per hour for a two-person, three-person, or four-person survey party includes the cost of all work necessary to complete the extra work.

Traffic control and flagging necessary because of the additional staking and layout required as a result of extra work ordered by the Engineer, or additional work resulting from contract expansion and ordered by the Engineer, shall conform to the requirements of Section-701, Maintenance and Protection of Traffic.

No payment will be made for the resetting of stakes, references, bench marks, and other survey control.

The amount per hour for an office survey technician shall include all necessary office supplies and equipment, such as calculators and computers.

SECTION 926 ENGINEER'S FIELD OFFICE:

926-1 Description:

The work under this section shall consist of furnishing a separate field office for the use by the Department's Engineering Consultant (Engineer) within the limits of the project.

The field office shall consist of a temporary building or trailer providing a minimum of 300 square feet of enclosed space and shall be provided with adequate lighting, ventilation and means of ingress and egress suitable to the intended use.

The office shall be equipped with heating and cooling equipment capable of maintaining an ambient air temperature of 70 ± five degrees F, a potable water supply and a separate enclosed sanitary facility with flush toilet and lavatory conforming with applicable sanitary codes. The office shall be furnished with three office desks with chairs, a drafting table with stool, and two multi-station telephones with separate lines.

The Engineer will designate the location of the office. The office shall remain on the project site for up to 30 calendar days following completion and acceptance of the work by the Department (or the construction phase of the work where landscape establishment is involved). The office shall be fully equipped with all utilities in service and shall be acceptable to the Engineer prior to commencement of any construction activity.

The contractor shall be responsible for maintaining the office and all facilities and equipment therein in good working condition. Utility costs shall be the responsibility of the contractor as well as any fees for permits, sanitary, water, electrical or gas hookups, installation charges, etc. The cost of long distance telephone calls made by the Engineer will be paid for by the Engineer.

Upon completion of the project and following removal of the office and any appurtenant structures, utilities, surfacing, etc., the affected areas shall be either restored to their former condition or improved as may be specified on the project plans.

926-2 Blank

926-3 Blank

926-4 Method of Measurement:

This work will be measured for payment as a single complete unit of work.

926-5 Basis of Payment:

Payment for this work will be made at the contract lump sum price, which price shall be full compensation for the item complete, including all labor, materials, equipment, all utility hook-up charges, maintenance, and all monthly utility charges, except for long distance telephone charges made by the Engineer as herein described and specified.

Partial payments will be made in accordance with the following provisions:

When five percent of the original contract amount is earned, 50 percent of the amount bid for Engineer's Field Office will be paid.

When 10 percent of the original contract amount is earned, 100 percent of the amount bid for Engineer's Field Office will be paid.

The adjustment provisions in Section 104 and the retention of funds provisions in Section 109 shall not apply to this item.

SECTION 927 ENGINEER'S FIELD LABORATORY:

927-1 Description:

The work under this section shall consist of furnishing a separate field laboratory for the use of the Department's Materials inspection and testing personnel within the limits of the project.

The field laboratory shall consist of a temporary building or trailer providing a minimum of 300 square feet of enclosed space and shall be provided with adequate lighting, ventilation and means of ingress and egress suitable to the intended use. The building or trailer shall be so supported as to be sufficiently stable so that the required testing procedures can be performed.

The laboratory shall be equipped with heating and cooling equipment capable of maintaining an ambient air temperature of 70 ± five degrees F, a potable water supply, and a separate enclosed sanitary facility with flush toilet and lavatory conforming with applicable sanitary codes. The laboratory shall be furnished with an office desk with chair, a drafting table with stool, and a telephone for the use of the Department. It shall be furnished with a work bench three feet wide by 10 feet long by 36 inches high with base cabinets and drawers for equipment storage, and with three 110-volt, 20-amp outlets above the bench, and with a service sink and water supply for testing purposes.

The Engineer will designate the location of the laboratory. The laboratory, equipped as stated above, shall remain on the site for a period not to exceed 30 calendar days following completion of the project. The office shall be fully equipped with all utilities in service and shall be acceptable to the Engineer prior to commencement of any work involving materials testing.

The contractor shall be responsible for maintaining the laboratory and all facilities and equipment therein in good working condition. Utility costs shall be the responsibility of the contractor as well as any fees for permits, sanitary, water, electrical or gas hookups, installation charges, etc. The cost of long distance telephone calls made by the Engineer will be paid for by the Engineer.

Upon completion of the work and following removal of the laboratory and any appurtenant structures, utilities, surfacing, etc., the affected areas shall be either restored to their former condition or improved as may be specified on the project plans.

927-2 Blank:

927-3 Blank:

927-4 Method of Measurement:

This work will be measured for payment by the lump sum as a single complete unit of work.

927-5 Basis of Payment:

Payment for this work will be made at the contract lump sum price which shall be full compensation for the item complete, including all labor, materials, equipment, all utility

hookup charges, maintenance, and all monthly utilities charges, except for long distance telephone charges made by the Engineer as herein described and specified.

Partial payments under this item will be made in accordance with the following provisions:

Sixty percent of the amount bid for Engineer's Field Laboratory will be paid with the first payment estimate after the laboratory is accepted by the Engineer.

The remaining forty percent will be paid in approximately equal monthly payments based on the expected use of the laboratory.

The adjustment provisions in Section 104 and the retention of funds provisions on Section 109 shall not apply to this item.

SECTION 928 FORMED RUMBLE STRIP:

928-1 Description:

The work under this section shall consist of forming rumble strips in the asphaltic concrete roadway shoulders at the locations shown and in accordance with the details on the plans and the requirements of these specifications.

928-2 Construction Requirements:

Rumble Strips shall be formed in the asphaltic concrete by making indentations a minimum of 7/8 inch deep by two feet in length and spaced at centers of approximately eight inches, in accordance with the details shown on the project plans.

The indentations shall be formed by rolling the asphaltic concrete, while still hot, with a tandem roller weighing not less than 12 tons. The roller shall have segments of two-inch outside diameter pipe welded to the driving roller drum.

The pipe segments shall be two feet long, cut longitudinally to provide a half segment, and capped on the ends. The pipe segments shall be welded to the roller drum at approximately eight-inch centers, with the rounded side of the pipe away from the drum.

If the rear tires are pneumatic, they shall have a smooth or slick tread design. The roller shall be equipped with an approved water system which will moisten the drums and tires so that the bituminous material will not be picked up. The roller shall also be equipped with an approved guide that extends in front of the roller and is clearly visible to the operator so that proper alignment of the strips will be obtained.

The equipment used shall be positioned by using planking, or by other approved means, so that the asphaltic concrete is indented only at those locations specified on the plans and to the dimensions specified herein and on the plans.

The forming of the Rumble Strips shall be accomplished in one pass of the equipment. The surface surrounding the indentations shall be smooth and nondeformed.

The asphaltic concrete shall be compacted to the degree specified in the appropriate section of the specifications.

928-3 Method of Measurement:

Formed rumble strips will be measured by the linear foot longitudinally along the edge of the shoulder on which the rumble strips are formed. Individual strips will not be measured for payment.

928-4 Basis of Payment:

The accepted quantities of formed rumble strips, measured as provided above, will be paid for at the contract unit price per foot, which price shall be full compensation for the item complete, as described and specified herein and on the project plans.